



# ANNALS OF SURGERY

A MONTHLY REVIEW OF SURGICAL SCIENCE AND PRACTICE

EDITED BY  
LEWIS STEPHEN PILCHER M D LL D  
OF NEW YORK

WITH THE COLLABORATION OF

J WILLIAM WHITE M D LL D	SIR WILLIAM MACEWEN M D LL D
OF PHILADELPHIA	OF GLASGOW
Professor of Surgery in the University of Pennsylvania	Professor of Surgery in the University of Glasgow

W WATSON CHEYNE C B F R S  
OF LONDON  
Professor of Surgery in King's College

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## CONTRIBUTORS TO VOLUME XLVII

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ALLIS OSCAR H MD of Philadelphia Surgeon to the Presbyterian Hospital

BARCOCK WAYNE W MD of Philadelphia Professor of Surgery in the Medical Department of the Temple College Surgeon in Chief to the Samaritan Hospital

BABLER EDMUND A. MD of St. Louis Mo Associate Surgeon to the St. Louis Skin and Cancer Hospital Assistant in Surgery in the Medical Department of Washington University

BARRETT CHANNING W MD of Chicago

BARTLETT WILLARD MD of St. Louis Mo Professor of Experimental Surgery in the Washington University

BLACKWOOD N J MD Surgeon U S Navy

BOGART ARTHUR H MD of Brooklyn N Y Surgeon to the Methodist Episcopal and to the Kings County Hospitals

BOGGS RUSSELL H MD of Pittsburgh Pa

BRISTON ALGERNON T MD of Brooklyn N Y Clinical Professor of Surgery in the Long Island Hospital Medical College

BUCHANAN JOHN J MD of Pittsburgh Pa Surgeon to Mercy and Columbia Hospitals Professor of Surgery and Clinical Surgery Western Pennsylvania Medical College

BUNTS FRANK E. MD of Cleveland Ohio Professor of Surgery in the Western Reserve University

CONNELL GREGORY F MD of Oshkosh Wisconsin Associate Surgeon to St. Mary's Hospital

CORNER EDRED M M.C. (Cantab) F.R.C.S (Eng) of London Eng Surgeon to St. Thomas Hospital and to the Children's Hospital Great Ormond Street in Charge of Out Patients

CRILE GEORGE MD of Cleveland Ohio Professor of Clinical Surgery in the Western Reserve University

CUSHING HARVEY MD of Baltimore MD Associate Professor of Surgery in Johns Hopkins University

DAWBARN ROBERT H M MD of New York Surgeon to the City Hospital and to the Polyclinic Hospital

DEAVER JOHN B of Philadelphia Surgeon in Chief to the German Hospital

DIXON CHARLES H MD of St. Louis Mo

DOWNES WILLIAM A MD of New York Surgeon to Out Patients



and Adjunct Assistant Surgeon, Bellevue Hospital, Instructor in Surgery,  
Cornell University Medical College

ELDER, J M, M D, of Montreal

ELSBERG, CHARLES A, M D, of New York, Adjunct Attending Surgeon to Mt Sinai Hospital

FISKE, EDWIN H, M D, of Brooklyn, N Y, Assistant Surgeon to the Kings County Hospital

GEIS, NORMAN PHILIP, M D, of Brooklyn, New York, Demonstrator of Anatomy in the Long Island College Hospital, Assistant Surgeon Williamsburg Hospital

GURD, FRASER B, M D, of Montreal, of the Pathological Laboratory of the Montreal General Hospital

GWYER, FREDERICK, M D, of New York, Surgeon to Bellevue Hospital

HARTE, RICHARD H, M D, of Philadelphia, Associate Professor of Surgery in the University of Pennsylvania, Surgeon to the Pennsylvania Hospital

HAYNES, IRVING S, M D, of New York, Surgeon to the Harlem Hospital

HEATH, HOMER H, M D, of Toledo, Ohio, Member of the Staff of St Vincent's Hospital

HOWITT, A B, M B (Cantab), of London, Eng, Late House Surgeon and Casualty Officer, St Thomas' Hospital

JACKSON, CHEVALIER, M D, of Pittsburgh, Pa

JONES, WILLIAM, M D, of Portland, Oregon

LAFFER, WALTER B, M D, of Cleveland, Ohio

LE CONTE, ROBERT G, M D, of Philadelphia, Pa, Surgeon to the Pennsylvania and the Children's Hospitals

LYDSTON, FRANK G, M D, of Chicago

MASON, J M, M D, of Birmingham, Ala

MAYO, WILLIAM J, M D, of Rochester, Minnesota, Surgeon to St Mary's Hospital

MEARS, J EWING, M D, of Philadelphia

MEYER, WILLY, M D, of New York, Professor of Surgery at the New York Post-Graduate Medical School and Hospital, Attending Surgeon to the German Hospital

MONKS, GEORGE H, M D, of Boston, Mass, Surgeon to the Boston City Hospital, Lecturer in Surgery, Harvard University Medical School

MORRIS, ROBERT T, M D, of New York, Professor of Surgery in the New York Post-Graduate Medical School

MOYNIHAN, B G A, M S, F R C S, of Leeds, England

MUMFORD, JAMES G, M D, of Boston, Mass

MURPHY, JOHN B, M D, of Chicago, Ill, Professor of Surgery in the Northwestern University

NANCREDE CHARLES B G DE MD of Ann Arbor Mich Professor of Surgery in the University of Michigan and in Dartmouth Medical College.

NELLES T B MD of Montreal of the Pathological Laboratory of the Montreal General Hospital

NOEHREN ALFRED H MD of New York Interne at German Hospital

OTTENBERG REUBEN MD of New York Interne at the German Hospital of New York.

POWERS CHARLES A MD of Denver Colo Professor of Surgery in the University of Denver

RICHARDSON OSCAR MD Assistant Pathologist to the Massachusetts General Hospital

ROBERTS JOHN B MD of Philadelphia Pa Professor of Surgery in the Philadelphia Polyclinic.

ROBINSON SAMUEL MD of Boston Mass

PODMAN WILLIAM L MD of Philadelphia Pa Professor of Surgery in the Medico Chirurgical College

SCUDDER CHARLES L MD of Boston Mass Surgeon to the Massachusetts General Hospital Lecturer in Surgery Harvard University Medical School

SELBY CLARENCE D MD of Toledo Ohio Member of the Staff of St. Vincent's Hospital

SHEPHERD FRANCIS J MD FRCS Edin (Hon) of Montreal Surgeon to the Montreal General Hospital

SMITH MARY ALMIRA MD of Boston Mass

SUMMERS JOHN E JR MD of Omaha Neb

TAYLOR HENRY LING MD of New York Professor of Orthopedic Surgery New York Post Graduate Medical School and Hospital

THOMAS BENJAMIN A MD of Philadelphia Assistant Instructor in Surgery in the University of Pennsylvania Assistant Surgeon in the Out Patient Department of the University Hospital

THOMAS TURNER T MD of Philadelphia Instructor in Surgery in the University of Pennsylvania Assistant Surgeon to the University and the Philadelphia General Hospitals

THOMPSON R L MD of St Louis Mo Professor of Pathology in the St Louis University

TORRANCE GASTON MD of Birmingham Ala Surgeon to St Vincent's and the Hillman Hospitals

VALE FRANK P MD of Washington DC

WALKER, JOHN B, M D, of New York, Surgeon Bellevue Hospital, Lecturer on Surgery, Columbia University

WERMUTH, W C, M D, of Chicago, Ill, Surgeon to the German Hospital

WHITMAN, ROYAL, M D, of New York, Adjunct Professor of Orthopedic Surgery in the College of Physicians and Surgeons, Associate Surgeon to the Hospital for Ruptured and Crippled

WOOD, ALFRED C, M D, of Philadelphia, Assistant Professor of Surgery in the University of Pennsylvania, Surgeon to the University, Philadelphia and St Timothy's Hospitals

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## ORIGINAL MEMOIRS

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### THE RELATION OF THE MESOCOLIC BAND TO GASTROENTEROSTOMY

BY WILLIAM J MAYO M D

OF ROCHESTER MINNESOTA

OTHER things being equal posterior gastrojejunostomy is the operation of choice. This does not mean however that the anterior method has become obsolete but rather that its field of usefulness has been greatly curtailed. All of our earlier operations were made anteriorly and a number of cases operated upon more than five years ago are to-day in perfect health.

The elimination of the loop has I believe been a most important step in advance. The great advantage of the posterior over the anterior method lies in the fact that the anterior requires from 16 to 20 inches of jejunum for the loop around the transverse colon while no loop at all is necessary in the posterior method.

In the April number of the ANNALS OF SURGERY 1906 page 537 I called attention to the fact that in the living subject the first portion of the jejunum usually passed from the duodenojejunal angle downward and to the left and for this reason advised that the jejunum be applied to the posterior wall of the stomach so as not to disturb this normal relationship instead of turning the bowel on a short angle to the right as had been the custom.

There seems to be some difference of opinion as to just what constitutes the "no loop" operation and particularly as to the frequency with which in the living subject the jejunum passes from its origin to the right. I think that much of the misconception as to the anatomical relationship comes from the variation in degree with which the peritoneal suspensory ligament extends down from the transverse mesocolon upon the upper part of the jejunum. The ligament of Trietz is an unimportant muscular structure covered by a small peritoneal fold as in Fig I, but this peritoneal reflection may be of such extent as to project downward several inches, as in Fig II.

It can readily be seen that as the intestinal coil is formed this peritoneal adhesion may extend so far down upon the coil as to reach the jejunum after it has turned to the right, and if the gastrojejunostomy is placed at this point, the intestine will be applied to the posterior wall of the stomach, not in the "no loop" position but upon a loop of from 4 to 6 inches, a situation which experience has shown to be exceedingly liable to give rise to bile regurgitation such as so frequently occurred in the "loop" operations of the past. The operator would erroneously believe that the jejunum turned to the right and that he had made a no loop operation while as a matter of fact a loop was present but more or less concealed in the investing peritoneum (Fig III).

When such peritoneal bands or adhesions exist to any considerable extent they should be trimmed back to expose the origin of the jejunum which will, in the great majority of cases, now be found to run in the normal direction to the left, and the gastrojejunostomy can be made at the beginning of the jejunum in the area which has been denuded of the adhesions (Fig III).

When this peritoneal band is pulled upon it will be found that it has its origin in the transverse mesocolon close to the left margin of the branch of the middle colic vessel which is to be seen in the drawings just to the right of the duodeno-jejunal juncture. The avascular space in the mesocolon lies



Sh g m l p t i f d w l l t t p a g t h l f N m l f m

FIG 2



Showing extensive peritoneal fold which turns the intestine to the right



Sh w th pe t lld pa t d D u d l show p pe t i f o-loop  
 g t r o e t o c l m y X m k th po t th t m l wh th t m b t  
 b b ght t





to the left of this adhesion and through this space the posterior wall of the stomach should be brought out for operation

There are several situations in the abdomen where peritoneal bands or adhesions are occasionally to be found. These bands may vary within wide limits and again be so frequently absent as to lead to the belief when they are present that they are pathological since disease may produce similar results.

In the fetus the lesser cavity of the peritoneum extends down between the omental fold. Soon after birth obliteration has usually extended as high as the transverse colon and in the adult the obliteration frequently extends higher especially along the pyloric half of the stomach so that posterior adhesions limiting the lesser cavity of the peritoneum may be mistakenly thought to be the result of disease. Peritoneal adhesions of the same character are often found connecting the sigmoid flexure of the colon to the pelvic wall. A very common example is the peritoneal reflexion which sometimes joins the gall bladder on its inner inferior aspect with the duodenum and transverse colon greatly resembling adhesions produced by cholecystitis.

# INTRACRANIAL ABSCESS DUE TO THE TYPHOID BACILLUS

BY FRASER B GURD, M.D., AND T. B. NELLES, M.D.,

OF MONTREAL,

From the Pathological Laboratory of the Montreal General Hospital

THE great dangers in fractures of the skull, either of the vault or base are, of course, in the early days following injury, (1) hæmorrhage either extradural or cerebral and (2) laceration of the brain tissue. Should the time of onset of symptoms due to either of these causes have elapsed, or should operative interference in the meantime have been called for, the temperature chart is carefully watched for evidences of infection at the site of the injury.

Infection may gain entrance to the intracranial cavity through one or more of several channels if the integument and underlying tissues have been lacerated or incised the ordinary organisms from the surface of the body or the air may have easy entrance. A similar portal of entry is afforded by any operation not performed under strictly aseptic precautions. Again the fracture may extend through the bone to one or other of the cranial cavities which communicates with the exterior, such as the nose and ears and their adjacent air cells, or the mouth, which normally contain pyogenic micro-organisms. Another source of infection is by the blood stream. That this form of infection does not more frequently occur is due in part to the fact that patients suffering from the various forms of bacteriæmia do not often receive fractures of the skull. The coincidence of these two misfortunes to the subject of our note was sufficient to induce the unique condition which we are about to describe.

Circumscribed abscess formation in the bones or soft tissues during and following attacks of typhoid fever are not infrequent. In all pyogenic infections local death of the cells due to trauma or other cause undoubtedly acts as a predispos-

ing factor Abscesses in the coccygeal region are not uncommon as a complication of typhoid fever a condition doubtless due to the invasion by the *B. typhosus* circulating in the blood of an area where the cells have been injured by pressure Cases have been reported of periostitis of the tibia in individuals suffering from an unsuspected ambulatory attack of typhoid fever in which a correct diagnosis was only determined by the bacteriological examination of the exudate and blood

There appears to be in the light of our own case a reasonable excuse for the suggestion that the occurrence of periostitis of the ribs in typhoid treated by baths may be the result of slight trauma received in the handling necessitated by such procedure This case also demonstrates the presence of an unusual factor which may complicate injury or perhaps even operative procedure namely subsequent infection of a blood clot through the circulation

C S aged 25 a machinist was admitted June 23 1907 to the Montreal General Hospital under the care of Dr Blackader attending physician and to his courtesy we are indebted for the medical notes of the case Very little history could be made out as the patient was stupid and drowsy and his friends apparently knew little about him It was established that one month previous to admission in a drunken brawl the patient had been struck on the right side of the head with a club and had had a lump on that side of his head ever since No recent history of injury could be obtained

Complaints upon admission headache constant and severe for eight days loss of appetite and drowsiness Patient gives no history of chills no diarrhoea He has always been healthy and strong but has used alcohol to excess for years

Present condition Patient is of middle age fairly well nourished of only fair intelligence He is very drowsy but can be roused to answer questions more or less intelligently Temperature 101 F Respirations 25 Pulse 72 regular small volume low tension Mucous membranes nails and palate are of good color Tongue is coated and dry teeth are covered with sordes breath is foul

The abdomen is normal in contour there are no rose spots

spleen is apparently enlarged but not palpable There is no glandular enlargement palpable

Respiratory and circulatory systems are practically normal with the exception of a few rales heard all over the chest

The left eyelid is ecchymotic and slightly œdematous The right upper lid is discolored but not swollen

On the right side of the head, above and in front of the ear and extending forward to the supraorbital ridge, the scalp is œdematous, red and tender over an area the size of one's palm In the right parietal region, towards the posterior part of this area, there appears to be a depression in the skull with an indefinite raised edge There are also abrasions over the left shoulder and right thigh There are no subconjunctival hæmorrhages and no evidence of bleeding from the ears, nose or pharynx There is no proptosis

Pupils are of medium size, equal and active to light and accommodation

There is no paralysis or paresis, no sensory disturbance

Reflexes knee jerks are absent, abdominal is absent A bilateral Kernig's sign is present There is a stiffness of the posterior muscles of the neck Patient has incontinence of urine at times

Diary June 25, two days after admission, patient has a positive Widal reaction in a dilution of one in eighty and a positive Ehrlich's diazo reaction in the urine A lumbar puncture performed removes 32 c c of clear fluid not apparently under tension Smears and cultures reported negative Blood count shows 5000 white cells During the five days following his admission, patient's condition changed but little The swelling on the scalp became softer and apparently contained pus On June 28, the patient was transferred to the surgical side and Dr Elder at once operated

*Operation*—Under chloroform an incision was made over the softest part of the swelling About 60 c c of pus and blood escaped exposing bare bone The abscess cavity was curetted and irrigated This procedure exposed a linear fracture of the parietal and frontal bones extending across the line of incision The bone behind the fracture was depressed The skull was trephined over this fracture and when the button of bone was taken out, a somewhat organized blood clot was seen overlying the dura under the

H. G. Lee

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[illegible]



depression. About 2 c.c. of pus were seen spread out as a thin film over the surface of this clot. With the fingers in the trephine opening this blood clot apparently about 150 c.c. could be felt to be forcing in the dura. The depressed pieces of skull were elevated and the trephine opening enlarged with rongeur forceps. The clot was then broken up with the finger, the cavity irrigated thoroughly with hot saline solution and packed with strips of iodoform gauze. The wound in the scalp was closed with silk worm gut sutures, save where the end of the gauze protruded and a dry dressing applied.

Following operation the patient's temperature remained continuous in type and moderately high. He was kept on typhoid regimen and his fever gradually dropped to normal during the third week after operation. (See temperature chart.) There were no rose spots at any time and the spleen was never palpable. The patient was discharged well four weeks after operation and so far as we know has since remained well and shows no brain symptoms.

Bacteriological report B 07-423 C S aged 25 June 28. The pus from the infected hæmatoma of the scalp planted upon blood serum develops in 24 hours a profuse growth of a motile bacillus which when stained by Gram's method and examined microscopically corresponds in morphology and staining reaction to the typhoid colon group. The organism grown in dextrose agar gelatine semi solid mixture produces a heavy cloud without gas formation. Neutral litmus milk is turned a delicate lilac color after twenty four hours. Dextrose and mannit litmus serum water media are first changed red and subsequently coagulated. Saccharose and lactose are not fermented. The blood serum from a patient in the third week of typhoid fever agglutinates the organism in a dilution of one in eighty.

TABLE I

O g' m B 07.423	De t m l d	N t l l t m m l k	D t o s e r u m w a t	La t o r u m w a t	M t u m w t	S h r o m w t
	N gas D i f f t b l d t y	N t o n l l	Co g u l t e d	N h a g	C d g u l t	N h g e

\* Agglutinated by immune serum in dilutions 1:40 and 1:80. Careful seedings of the material from both the subdural and the extradural



From the pus in the intracranial abscess is isolated an organism in pure culture which is similar in every respect to that isolated from the hæmatoma of the scalp. A blood culture was taken on June 28 and an organism isolated in the bile medium corresponding completely with that found in the head.

The microscopic examination of the blood clot shows a slight attempt at organization and a well marked infiltration with polymorphonuclear leucocytes.

The interest in this case lies in the fact that here we had a patient who was undoubtedly suffering from typhoid fever, exhibiting such well marked focal symptoms that it was possible to diagnose a brain lesion which was probably connected with the blow received some weeks before he came to the hospital. But what was the relation between the two? If his cerebral symptoms were due to hæmorrhage why had they been so long delayed? If due to acute encephalitis complicating typhoid fever why were they localized? So far as we could determine there had never been a compound wound and hence direct infection *ab extra* could be excluded.

The result of examination and treatment proved that both these factors had contributed to the condition, viz., the blow caused the blood clot which the typhoid bacillus infected and so an abscess developed. Whether the bacillus was present in the blood at the time of injury or whether the typhoid fever developed subsequently is difficult to say. It is probable that if the injury of one month previous to admission was the cause of the fracture, the invasion of the body by the bacillus typhosus occurred after the injury. There is, however, reason for suspecting that a more recent accident must have been the cause of the fracture, especially as the ecchymosis of the eyelids and abrasions of the limbs were suggestive of a more recent injury.

At operation it was thought that, possibly, the fracture extended through the frontal bone into the frontal sinus and

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pus collections upon blood serum and agar were made in a series of tubes and in all there was obtained a pure culture of *B. typhosus*.

that by this channel the infecting agent had gained entrance. The bacteriological examination however corrected the idea and proved that the infection was through the blood current and not from the frontal sinus.

For permission to publish the clinical notes of this case we are indebted to Drs Blackader and Filder of the attending staff of the Montreal General Hospital. We wish also to thank Dr Lyman for help in the preparation of the medical notes of the case.

# ISOLATED FRACTURE OF THE GREATER TUBEROSITY OF THE HUMERUS \*

BY HENRY LING TAYLOR, M D,

OF NEW YORK,

Professor of Orthopedic Surgery, New York Post Graduate Medical School  
and Hospital

TRAUMATIC separation of the greater tuberosity of the humerus occasionally occurs as a complication of dislocation of the shoulder, when it may obstruct reduction, predispose to recurrence or lead to prolonged disability. Isolated fracture is considered very rare by the authorities, at least one doubts its existence. The more general use of the X-ray in shoulder injuries will doubtless show that this accident is less infrequent than has been supposed.

It is hoped that the two following observations may aid in clearing up the clinical picture, which is somewhat hazy in the standard works.

CASE I —On August 16, 1903, a man 46 years old and weighing about 175 pounds, was pitched down three or four steps by the lurching of an ocean steamer, and landed squarely on the front of the tip of the left shoulder. There was total disability in abduction and rotation, soon followed by great swelling of the shoulder and arm and by a large ecchymosis on the outer aspect of the arm extending finally to the dorsum of the hand. The arm was examined about 15 hours later by the ship's surgeon, who found pain on rotation, tenderness over the outer part of the shoulder, but no crepitus and no dislocation, he regarded the injury as a severe contusion, and the arm was carried in a sling for the remainder of the trip with only moderate discomfort except for dressing and undressing, when assistance was required. There was no confinement to bed.

On landing in New York, August 22, 1903, Dr Forbes Hawkes was consulted and a skiagram was taken, which showed

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\* Read at the meeting of the American Orthopedic Association, Washington, D C, May 9, 1907

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FIG 3

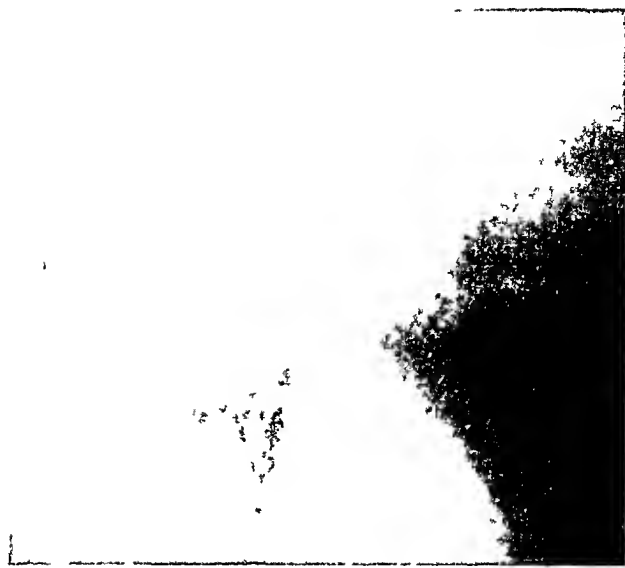


FIG 4



complete separation of the greater tuberosity with displacement upward and outward of about a quarter of an inch. The backward displacement which may have existed did not show in the plate. The shoulder and arm were placed in a plaster splint for two days after which the sling was resumed.

The swelling and ecchymosis slowly disappeared and with out massage or special exercises the function of the shoulder was gradually resumed. A plate taken early in November 1903 eleven weeks after the accident showed the tuberosity abnormally prominent and bony union taking place (Fig 1). About this time the function of the arm was fairly good and soon after became entirely restored for all ordinary uses. At the present time the patient is conscious of no defect in strength or function the hand can be placed behind the back and raised vertically above the head though critical examination reveals some diminution of abduction and external rotation at the shoulder. A skiagram taken March 19 1907 shows the trochanter like prominence of the greater tuberosity which can be easily palpated and bony fusion with the shaft (Fig 2).

CASE II—A stout lady about 80 years old on September 25 1906 fell forward while going down stairs striking an upright board with the outstretched left hand. There was shoulder disability and much swelling and ecchymosis of the outer and inner side of the arm a surgeon was called in and a diagnosis of fracture of the upper end of the humerus was made. Ice was applied for a week and on October 3 the arm and shoulder were put up in a starch bandage. This patient was first seen by the narrator on October 23 1906 four weeks after the accident. There was a little active and more passive motion at the shoulder but little abduction or external rotation.

There was tenderness and some prominence of the greater tuberosity but no crepitus and the head was in the glenoid cavity. There was much swelling about the shoulder and also about the arm above the elbow particularly on the inner side and extensive ecchymosis on the outer side reaching below the elbow and on the inner side to just above the elbow. A skiagram taken October 27 1906 showed separation of the greater tuberosity of the left humerus with slight upward and outward displacement backward displacement did not show in the anterior view there was also a splinter of bone on the inner side of the humeral neck.

which possibly indicated a separation of the lesser tuberosity, union seemed to be taking place (Fig 3) After a few days the starch splint was discontinued, and the arm supported by a bandage and later by a sling The vibrator was used to the shoulder and arm muscles two or three times a week for several weeks Strength and mobility of the shoulder gradually increased, and when the patient was last seen, February 19, 1907, she had very fair use of the arm, which could be abducted without scapular motion to about  $60^{\circ}$ , and rotated to about  $50^{\circ}$  The hand could be raised high above the head, and with some difficulty placed behind the back The plate taken February 13, 1907, shows prominence of the tuberosity with apparent bony union, and a bony nodule the size of a small pea on the inner side of the neck (Fig 4)

From these two cases one may conclude that isolated traumatic separation of the greater tuberosity may occur from direct or indirect violence, that the displacement of the fragment may be upward, outward, and backward and very moderate in amount, that early disability at the shoulder, swelling and ecchymosis are prominent symptoms that crepitus may be absent, that in uncomplicated cases with moderate displacement, splinting in abduction and external rotation, suturing, nailing, and confinement to bed, are unnecessary, that bony union occurs, and that recovery may be practically perfect without splints, massage or special movements

# A CONTRIBUTION TO THE DIAGNOSIS OF RENAL TUBERCULOSIS

BY R. P. CAMPBELL M.D.

OF MONTREAL

Surgeon to the Otolaryngological Hospital  
Department of Medicine  
McGill University

MUCH interest of recent years has centered in the question of renal tuberculosis. In 1906 it occupied the German Surgical Congress in Berlin while scarcely a surgeon of genito urinary note nor a pathologist but has expressed himself with reference to the mode of incidence and extension of tuberculosis in the genito urinary tract. Are we to regard this infection as originating in the kidneys and descending or as occurring first in the lower part of the tract and ascending to the kidneys? Is it then but a secondary expression of tuberculosis elsewhere or may it be a primary disease? Can then a nephrectomy offer a reasonable chance of cure or must we be content with internal medication and treatment and look upon such patients as beyond our help? And finally what should be the surgeon's position with regard to tuberculosis of the bladder?

While the position of the surgeon must be that of awaiting more definite proof our present knowledge in our opinion demands that he recognize

First that tuberculosis of the kidney is a blood infection rather than an ascending infection from the bladder etc

Second that it may be and often is a primary rather than a secondary manifestation and may affect one kidney while the other long remains free

Third that the only promising treatment is excision

Fourth hence early diagnosis is of prime importance

Fifth that the cystoscope and ureteral catheter offer us the strongest support not only in the diagnosis but also in the prognosis by giving us information as to the physiological or pathological condition of the sister organ and of the bladder information indeed as to the very presence of the former



Tuberculosis of the genito-urinary tract was first described early in the last century and was then regarded as an entity, it was not until 1863 that Schmittlein demonstrated that there was a urinary variety (affecting kidney, ureter and bladder) as well as a genital variety, and later Steinthal showed the importance of "primary" urinary or renal tuberculosis

From a study of the following cases we were forced to conclude, in so far as so small a number will admit of a conclusion, that a focus in the kidney was the commonest origin of genito-urinary tuberculosis and one is not surprised on searching for further evidence on this point to find the unanimity of opinion in this respect. Among continental surgeons Caspar, Kummel, Zuckerkandl, Korteweg, Rovsing, Halle and Motz, Israel, Tuffei, Vigneion, Fenwick in England, Vanderveer and Walker, and others, in America, Ribbert and Adams, among other pathologists, speak for a blood infection of the kidney and a descending infection of the genito-urinary tract. Added to this are the now classic experiments of Baumgarten, later confirmed by Giani, who endeavored by first infecting the bladder, to obtain an ascending infection to the kidneys but without success. While Pels Lenden, by infecting the kidneys equally failed to cause a descending infection of ureter and bladder, Baumgarten, Durand, Fordel, Hauser were able to produce disease of the kidney by infecting it by means of intravenous injections. The late Professor Schede states that it is the general opinion that an ascending infection is also possible, though proof of this is lacking. Where we might have for example a tubercular epididymitis of some standing and a recent tuberculosis of the kidney, affecting chiefly the points of the pyramids, this view might receive support. So far in our experience, however, the incidence of the lesion associated with the renal disease has always occurred after the symptoms of involvement of the kidney have declared themselves.

To prove that a primary hæmatogenous infection of the kidney exists is easier than to prove it the rule. The case described as Case I, which subsequently came to autopsy,

supports the former while as far as clinical facts can be relied upon the remaining cases with the exception of Case III support the latter. Here perhaps we should define what we mean by primary. We have used it in the same sense as we speak of a primary tuberculosis in the lung. This may be a direct infection from the air but the opinion of many pathologists—Ribbert, Adams, Orth, Councilman, Calmette and others—leans more and more to an infection entering through some portal of the digestive tract and thence by lymph stream and blood directly or by first infecting some lymph gland and so indirectly infecting lung or kidney or other organ as the case may be. It is in this sense of an infection possibly from some unrecognizable source that we apply the term.

In Case I the patient after a long illness with early signs of kidney involvement and at a later date some affection of the epididymis underwent a nephrectomy and castration. Several months later he died of acute miliary tuberculosis. The autopsy showed all organs equally affected with the miliary type of the disease but there was no old lesion which could be regarded as the source either of the present miliary condition or of the former kidney lesion. In other words a primary unilateral tuberculosis had existed.

Such a condition of affairs where one kidney alone is diseased is not one to last for long sooner or later we must expect either that other organs become affected or a general miliary tuberculosis and an end similar to that just quoted. Naturally we should expect the pelvis and ureter to be first affected but true tuberculosis of the ureter seems far less common than a sclerosing secondary inflammation. The bladder is early affected (45 per cent—Israel) while the prostate, seminal vesicles and epididymes may be later attacked. All of which facts urge us to the earliest possible diagnosis and removal of the infected lesion. And in these questions also with the partial exception of Israel and Kuster who advise (the former) a trial by medication and (the latter) a partial excision one finds the same unanimity of opinion that the question of primary renal tuberculosis evoked. What however has brought

about this unanimity of opinion as to the earliest focus in the genito-urinary tract? Early diagnosis Formerly we had to rely on post-mortem examinations, where the disease had frequently progressed far enough to have caused the patient's death Of late we have many surgical cases, diagnosed early, which have shown us that the kidney was principally, or even alone involved, not only so but renal disease is at least frequently unilateral Vigneron quotes 250 autopsies of renal tuberculosis, 123 of which were one-sided, while of 100 surgical cases but 17 were bilateral Tuffier of 205 surgical cases found 99 unilateral, and Israel quotes 21 cases, 16 of which he considers primary and unilateral

The early diagnosis of tuberculosis of the kidney is not easy Just as is the case with tuberculosis elsewhere the phthisical history, the failing health, the possible evening rise of temperature, point in the right direction and taken in conjunction with local manifestations, such as the occurrence of pus and blood in the urine and symptoms of bladder involvement and enlargement of the kidney, would doubtless lead to a correct conclusion, even without the detection of the tubercle bacilli It is not, however, in such cases that we can do the most good, but where we can detect the disease before enlargement of the kidney and marked involvement of the bladder has occurred We say marked, for a moderate involvement of the bladder is not the contraindication we perhaps once thought it The occurrence of pus or blood in the urine must always raise this possibility before us, but cases exist still more difficult where possibly no symptoms but a pyelitis may be present In all these cases the cystoscope and its accessories may render us valuable aid Simple cystoscopic examination of the bladder is, as Fenwick has long shown, often invaluable A close inspection of the ureteral orifices determining the presence of œdema—the “bullous œdema” of Caspari, about the opening, the occurrence of tubercles, later ulceration, and still later displacement of the orifice due to contraction of the ureter secondary to a sclerosing inflammation, are the points of chief interest and may suffice to lead us to a correct conclusion

Nevertheless where one has gone so far he is scarcely justified not to go further and complete the clinical picture by catheterization of the ureters difficult as this may be in these cases. The ureteral catheter is not a magic wand but by it we can glean certain information often of the greatest importance. It furnishes the one certain method of collecting the separate urines and delivering them free from bladder contamination. It gives at the same time information as to the patency of the ureter and frequently as to its dilatation. Naturally we must rely chiefly on a careful examination of the urines so delivered and no means which may give us information in this respect can be neglected. Where possible cryoscopy and the estimation of sugar after the injection of phlorizin should be carried out but we can support Rovsing who lays chief stress on the specific gravity the urea determination and proper microscopical examination. It is in short the ureteral catheter rather than the so called functional diagnosis which has led to the present improvement in renal operative statistics. Of course in some cases the most cursory examination of the urine so obtained suffices the presence of pus from one kidney possibly with tubercle bacilli sets our minds at rest as to the site of the lesion yet in all instances we should insist on examination of both sides bilateral catheterization as only on a comparison of one side with the other can we determine the functional ability of the sister kidney and in many instances it is on this comparison our diagnosis of disease must be made.

Following the hypothesis advanced and elaborated by Caspar that in health both kidneys secrete a urine similar in all particulars a theory which a large number of cases examined by him amply justifies and to the correctness of which our own cases lend evidence and depending on the additional fact that a diseased kidney has its functioning power impaired a fact also borne out by those accustomed to compare the work of one kidney with its fellow we are enabled from the difference in the urinary secretion to draw certain conclusions as to the state of the kidney. Let me illustrate a case of for instance

movable kidney, where, other diagnoses being possible an examination by catheterization of the ureters was made with the following result.

	COMMON	RIGHT	LEFT
Reaction	Acid	Acid	Acid
Specific Gravity	1010	1011	1011
Urea	8 per cent	8 per cent	8 per cent.
Albumin	0	0	Trace
Microscopical	Epithelium	Epithelium	Epithelium

Or a case of nephritis

	COMMON	RIGHT	LEFT
Color	Clear	Clear	Clear
Reaction	Acid	Acid	Acid
Specific Gravity	—	1037	1037
Albumin	Trace	Trace	Trace
Urea	—	2 per cent	18 per cent
Δ	—	—18	—19
Sugar (Phlorizin)	—	125	10
Microscopical	Hyaline casts		

We are enabled to say in the first instance that the kidneys are normal, and in the second a bilateral lesion of equal severity exists

The actual values for specific gravity, urea, etc., may scarcely be within normal limits, due perhaps to a patient taking a quantity of fluid immediately before examination. Where however disease exists, as we hope to demonstrate by the following cases, the relation of one side to the other is upset. Even so we are unable to state that the sister organ is absolutely free from disease, but we can state as a result of our examination into its function that it is doing the larger share or it may be the whole of the necessary secretion and presents no sign of disease. It is therefore probably healthy. It has thus been our custom in those cases referred to us to endeavor to reach a correct conclusion by means of the cystoscope and ureteral catheter.

CASE I—L., aged 38—Dr G E Armstrong—a farmer, complained on February 23, 1906, of pain in the back and the end

of the penis more especially on micturition and exertion also of pain and swelling of the left testicle and loss of 30 pounds in weight. The history of his illness began 3 years previously. While working at some heavy labor he was seized with an urgent desire to micturate and experienced some pain in the back. He passed a small amount of blood. The hæmaturia lasted one month after which he recovered and was as well as ever for a further eight months (spring 1904) when after exposure in cold water the symptoms returned and lasted one and one half months. He then remained fairly well till March 1905 when again subsequent to heavy manual labor the bleeding returned to be followed during the summer by some swelling of the left testicle and some cloudiness of his urine. The pain in the back became worse and for some six weeks previous to admission (Feb. 1906) to the Montreal General Hospital he had been confined to bed.

Such a history pointed to a tubercular condition of the genito-urinary tract but where the lesion was situated and just what hope might be held out to the patient was far from certain. Physical examination showed a pulse rate of 84-104 temperature 99-100 F a swollen nodular left epididymis some tenderness of both epididymes and of the left seminal vesicle. The urine examination showed the specimen to be acid specific gravity 1018 a trace of albumin granular and hyaline casts and pus in considerable quantity. The kidneys were not palpable. The lungs showed no sign of disease.

A cystoscopic examination showed a slough the size of a finger nail lying in the base of the bladder and a small ulcer about 5 mm in diameter about the left ureter. The urine from this side was turbid. The ureters were catheterized with the following results:

Right. Clear mucoid sediment specific gravity 1009 yellow albumin (?) urea 16 per cent. (blood discs epithelium) no bacilli.

Left. Turbid purulent sediment specific gravity 1004 pale albumin present (large quantity) urea  $\frac{1}{2}$  per cent. blood pus and tubercle bacilli.

Thus we were enabled to make a diagnosis of tuberculosis of the left kidney with slight involvement of the bladder and involvement of the left epididymis. Although the lapse of time since the first appearance of symptoms did not lead us to hope for any brilliant result yet as the right kidney was in good condition and the

left almost functionless a nephrectomy was performed. A large kidney with well marked tuberculosis of the pelvis and kidney tissue and ureter was removed with but slight alteration in the amount of urine passed in the 24 hours, confirming the belief that the damaged kidney was doing but little work. Subsequently the testis was removed.

The patient recovered fully from the operation but died during the following summer from miliary tuberculosis. The autopsy showed the sister kidney free from any old standing disease, indeed no other old focus was to be found, confirming our opinion that the primary lesion had been in the left kidney. It is interesting to note here the hæmaturia as an initial symptom and the length of time which the disease apparently remained confined to one kidney.

CASE II—M B, female aged 29—Dr J M Elder, December 18, 1905—recently emigrated from England, a cotton mill worker, had suffered from pain in the back for six or seven weeks. At first this was dull and trivial but later grew so severe as to cause her to give up her work and seek relief. She had lost some weight but gave no urinary history. On examination she proved to be a poorly nourished woman with a temperature range of 99°–100° and pulse rate as high as 140. Tenderness was present on the right side below the costal margin with dulness to percussion continuous with that of the liver. A mass could be felt in this position. The urine was acid, with a specific gravity of 1015, albumin was present and pus. The condition looked like an ordinary slight pyonephrosis.

The cystoscope showed a well marked cystitis, not tubercular in character, and about the right ureter a small ulcer the size of the head of a lead pencil. From the bottom of this a stream of pus spurts two or three times a minute, not unlike the smoke from the crater of a volcano. Compression of the abdominal mass between the hands causes the stream to increase. The urines were separated by catheters with the following result, 1 c c of phlorizin being injected hypodermically one half hour before the examination in order to cause glycosuria.

Right. Acid, specific gravity 1015, albumin present, sugar 0, urea 16 per cent, pus in considerable quantity, no tubercle bacilli, many cocci.

Left. Acid, specific gravity —, albumin a trace, sugar present, urea 18 per cent, no pus or bacilli.

From this we concluded that the left kidney was healthy indeed all the phlorizin was secreted by the left although the urea determination showed but slight difference (probably an error) and the right side still had a high specific gravity due in part however to the large quantity of pus present. From the ulcer about the ureteral orifice we felt that the question of tuberculosis could not be dismissed although no bacilli could be found on careful examination and other infective organisms were present. A tentative diagnosis of tuberculosis of the right kidney was therefore made and a nephrectomy advised and performed.

A large kidney distended with thin pus and with one or two cysts the size of a marble similarly distended was the result. Macroscopically no typical tubercular change was present and no bacilli could be found in the scrapings. Microscopically however several typical tubercles with giant cells, necrosis, epithelioid cells and a surrounding zone of small round cells were found and the clinical diagnosis was confirmed.

No interference with the quantity of urine passed occurred the quantities for the days following operation being 18 17 20 14 ounces practically the same as those immediately preceding but the quantity rapidly increased to 41 37 39 42 and 32 ounces per diem a fact frequently seen and due in part to the fact that the absorption of toxic material from the diseased kidney interferes with the normal secretion of its fellow. The patient made an uninterrupted recovery. A cystoscopic examination previous to discharge from hospital showed no ulceration about the ureter and in December 1906 one year later the patient was still in good health and examination of the urine and bladder showed these perfectly normal.

CASE III—T male aged 30—Dr F C Finley October 28 1905. This patient who was suffering from pulmonary tuberculosis suddenly developed hæmaturia and an examination was undertaken to prove the nature of the lesion. Both ureters were catheterized and urine collected simultaneously as before. Without going into detail suffice it to say that the right urine was turbid containing a few pus cells and many blood casts the left was also turbid with many pus cells and a few casts. No bacilli were found in the right but these were present in the left. A diagnosis of bilateral tubercular nephritis was made and no operation performed.



CASE IV —R, male, aged 35—Dr G E Armstrong, December 24, 1906 This case proved of more than usual interest The patient had suffered for about six months from frequency and the occurrence of pus and blood in the urine according to his physician's statement Tubercle bacilli had been reported in the urine but the seat of disease had not been determined and the patient was referred to hospital for further investigation

The presence of bacilli was confirmed, also the presence of pus and microscopical quantities of blood The bladder on examination was extremely sensitive, scarcely holding five ounces and one was not surprised on cystoscopic examination to find marked congestion of the surface with the presence of two or three tubercles the size of a pin's head about the trigone and an ulcer 5 mm in diameter about the orifice of the left ureter As not infrequently happens, however, in such cases it was extremely difficult to find the orifice of the ureters owing, as Caspar has shown, to the congestion and œdema present In fact in many instances it is necessary to be guided by the stream of urine issuing from the ureter After a somewhat prolonged search, however, the right ureter was found but so over-shadowed by the slightly enlarged prostate that its catheterization was impossible The left ureter was catheterized, being found at the bottom of the ulcer aforementioned, and considerably displaced to the left, owing, as was subsequently proved to the thickened and contracted ureter The urine from the right kidney was obtained by leaving a catheter in the bladder after thorough washing, while the ureteral catheter was in the left ureter Compared the one with the other the urines were as follows

Right Acid, specific gravity 1025, yellow, mucoid sediment, urea 17 per cent, a trace of albumin, Ca oxalate, a few pus cells, no bacilli

Left Neutral, specific gravity 1008, pale, flocculent sediment, urea 3 per cent, albumin present in considerable quantity, pus in quantity and tubercle bacilli

The left kidney was evidently diseased and as it was doing but a tithe of the work of its fellow, removal was indicated This was done and a large kidney with a slightly dilated pelvis, with a thickened fibrous ureter, with caseous material in calices extending up into pyramids and tubercles in all stages throughout cortex and medulla resulted In other words a well advanced

tuberculosis renis The ureter was in part removed The bladder was left to take care of itself as in these cases it seems well able to do

The patient made an uneventful recovery the quantity of urine per diem being unaltered and all symptoms improving While it is too early at this date to form any opinion as to the ultimate outcome the prospects are of the brightest and at date of writing October 1907 the patient weighs 20 pounds more than at any previous time The bladder condition is as yet stationary

CASE V—W McK. male aged 22—Dr G E Armstrong February 9 1907—complains of frequency for the past eight months No history of pain no hæmaturia no loss of weight Three weeks previous to observation swelling and tenderness of the left epididymis was observed (no venereal history) this has persisted On examination the left seminal vesicle was found somewhat indurated but not tender The urine showed the presence of pus and tubercle bacilli Cystoscopic examination revealed a normal urethra a bladder capacity of 300 cc the right urethral orifice normal the left swollen and oedematous one yellow spot was present just below the meatus and two were to be found in the left side of the bladder high up and several others about the trigone which is slightly reddened Pus is to be seen lying in base of bladder The ureters were catheterized and the urine compared as follows

	COMMON	RIGHT	LEFT
Reaction	Acid	Acid	Alkaline
Color	Pale	Clear	Turbid
Sediment	Flocculent	Slight flocculent	Flocculent
Specific Gravity	1015	1017	1013
Urea	—	22 per cent.	13 per cent
$\Delta$	—	—13	—9
Microscopical	Pus tubercle bacilli	Epithelial cells no tubercle bacilli	Blood pus and tubercle bacilli

From this a diagnosis of tuberculosis of the left kidney was readily made At the same time the interference with the function of this organ as compared with the right was but slight and in consequence the probability was that but a slight lesion was present The truth of this interpretation was markedly demon

strated at operation On removing the kidney nothing was evident on or beneath the capsule, nor indeed on first sectioning the organ, and it was only after opening up all the calices that one was found, where all the points of the pyramids projecting into it showed macro- and microscopically typical tubercle formation, in fact the point of greatest interest in this case lies in the fact that a lesion affecting so small a portion of kidney tissue could have produced so much interference with its function

CASE VI—McD, male aged 40—Dr E M von Eberts, February 23, 1907 This patient suffered severely from pain in the right side and back incapacitating him from work Pus was present in the urine and a small hard mass was palpable in the right side of the abdomen He had lost weight In consequence he was referred for cystoscopic examination The left ureter was easily found and catheterized, but the orifice of the right could not be found on two separate examinations, the reason therefor, as evidenced by subsequent events being a sclerosing ureteritis which almost obliterated the lumen of the ureter Beyond an hypertrophy of the prostate nothing further abnormal was found in the bladder The urine from the left kidney was obtained by catheter, that from the right by first washing the bladder and leaving a soft rubber catheter in it The urine thus simultaneously obtained and a common specimen obtained by catheter from the bladder showed

	COMMON	RIGHT	LEFT
Color	Turbid	Turbid	—
Specific Gravity	1025	1010	1018
Reaction	Acid	Acid	Acid
Albumin	Present	Present	0
Microscopic	Pus	Blood cells & pus, no tubercle bacilli	No pus

Evidently the right side was affected

Taking cognizance of the fact that in tuberculosis the ureteral orifice of the affected side is often masked and displaced, a careful search was continued for tubercle bacilli and finally rewarded by finding these micro-organisms A nephrectomy was undertaken and a small fibrosed kidney, with large caseous masses throughout, and microscopically typical tubercle formation, removed

The point of interest here lies in the ureter which was a thick (size of a 30 F sound) fibrosed tube extremely tense and drawing the kidney down and right side of bladder up thus accounting for displacement of the orifice while the extremely small lumen accounted for the difficulty in locating it

The patient made an uninterrupted recovery from the operation which apparently had no influence on the daily amount of urine excreted. What the ultimate outcome will be of a disease which had evidently been of long standing must be left to the future

CASE VII—P N male aged 50—Dr F J Shepherd October 30 1906 Two years previous to admission he had noticed blood in the urine. This had recurred on three subsequent occasions. He had also suffered from frequency and pain in the perineum which persisted up to the present. Examination of the urine showed the presence of pus and tubercle bacilli

A cystoscopic examination was undertaken and the right ureteral orifice found normal. The left meatus was reddened and cedematous and a small slough and ulcer high up on the left side led one to make a diagnosis of tubercular cystitis. The fact which has lately been emphasized by Walker of Johns Hopkins that primary tuberculosis of the bladder is extremely rare had not as yet made sufficient impression on me. The right ureter was catheterized but owing to an accident to the other catheter we had to be content to take the left urine through the bladder after a preliminary washing. In comparison of the right left and common specimens the latter obtained by catheter immediately previous to examination the following results were obtained

	COMMON	RIGHT	LEFT
Color	Turbid	Clear	Turbid
Specific Gravity	105	1027	1025
Albumin	Present	—	—
Urea	25	26	23
Microscopic	Pus and blood tubercle bacilli	No pus or blood or tubercle bacilli	Tubercle bacilli and blood

It was in consequence of the almost undisturbed function of the left side that a diagnosis of cystitis was adhered to in spite of the small ulcer and cedema near the left meatus and the patient

was handed over to Dr von Eberts for observation on his opsonic index and tuberculin treatment

Under this and hygienic treatment improvement was most marked, the patient gaining weight rapidly and losing his discomfort till in February, 1907, four months later no sign of the former ulcer was evident though some oedema remained and tubercle bacilli could still be found in the urine

These observations leave no doubt in my own mind that here we had to deal not with a tuberculous cystitis, but with a tuberculous disease of the left kidney and secondary disease of the bladder. The patient continued to improve and hence the question of nephrectomy which would have settled all doubts has never been discussed. The case is of interest in showing the beneficial results of small doses of tuberculin in cases of genito-urinary tuberculosis

CASE VIII—Mrs C, aged 24—Dr E M von Eberts, February 18, 1907. Had been ill about one year with pain in the left loin and pyuria. She had lost some weight and a mass was present in the left side of the abdomen, which was most probably kidney. A cystoscopic examination was undertaken and the right meatus found normal. In place of the left was a large white slough the size of a large pea, which was displaced by the catheter and the mouth of the ureter disclosed. No definite tubercles were evident about this, but it was markedly reddened and slightly ulcerated. In addition a ridge was seen stretching from the left orifice towards the left and giving the appearance which a normal ureter gives when a rather stiff catheter is in place, suggesting that the ureter was under tension. The ureters were catheterized, the right flowed in normal spurts, the left slowly in drops and this was hastened by pressure on the abdominal mass. Examination of the urines showed

	COMMON	RIGHT	LEFT
Reaction	Acid	Acid	Acid
Color	Turbid	Clear	Very turbid
Sediment	Purulent sed	No sediment	Purulent sed
Specific Gravity	1013	1022	1007
Urea	1 per cent	2 per cent	0.5 per cent
Albumin	Trace	Trace	Present
Sugar (Phlorizin)	—	Present	0
Microscopical	Pus, tubercle bacilli	No pus	Pus and blood, tubercle bacilli, diplobacilli

Consequently we made a diagnosis of tuberculosis of the left kidney and a sound organ on the right. A nephrectomy showed a large caseous kidney with practically no secreting tissue left and many adhesions about it while the ureter was so tense as to seriously interfere with the removal of the organ. The patient made an uninterrupted recovery and is now apparently in the best of health.

CASE IX.—J. B. female aged 35—Dr. J. M. Elder September 4, 1907—had not been well for 2 or 3 months but did not consult a physician till a week previous to admission to the hospital when she experienced a severe attack of pain in the left side accompanied by a chill and sweating. The urine was subsequently dark colored. Five such attacks occurred two while under observation in the hospital. They caused nausea but no vomiting and were aggravated by exertion. In short the history was that of a renal colic. A loss of weight of some 20 pounds had occurred inside the last year. Three sisters died of pulmonary tuberculosis. The urine contained pus, nothing could be made out on palpation of the abdomen.

A cystoscopic examination showed a normal bladder except for the fact that the right ureteral orifice was much reddened, oedematous and slightly depressed and about this on close inspection were 2 or 3 tubercle like spots with a greyish centre. Both ureters were catheterized and the urines examined and compared as follows. (Owing to some error the patient had been allowed to drink copiously before the examination hence the low specific gravities present.)

	COMMON	RIGHT	LEFT
Reaction	Acid	Acid	Acid
Specific Gravity	1007	1007	1008
Sediment	Slight flocculent sediment	Slight flocculent sediment	Clear
Albumin	0	Present	Present
Urea	—	1.2 per cent	1.5 per cent
Micoscopic	Pus	Pus	No pus a few red blood cells

No tubercle bacilli could be found on repeated examination but in spite of this and founded largely on the appearance of the ureteral orifice a diagnosis of tuberculosis was made. A nephrec-

tomy was undertaken and a kidney slightly enlarged with many adhesions about it was removed. About both poles a number of tubercles were to be seen and on section these were also found about the calices of both poles and in the pelvis where a deposit of lime salts had taken place. No doubt a fragment from these deposits had been responsible for the renal colic.

CASE X—K, male, aged 25, stone-cutter—Drs F J Shepherd and H A Lafleur, August 14, 1907. Three months previous to admission patient noticed some pain in the perineum and two weeks later some pain on micturition. This caused him to stop work and seek relief. A perineal abscess was opened and gradually healed. In August, 1907, he was admitted to the hospital for a febricula and on routine examination pus was discovered in his urine. Physical examination was negative.

A cystoscopic examination was made. The right ureteral orifice appeared normal. The left was swollen, reddened and œdematous so that the slightly turbid urine which could be seen issuing from it appeared to come from between small bullæ. Both ureters were catheterized with the following result.

	COMMON	RIGHT	LEFT
Color	Turbid	Clear	Turbid
Reaction	Acid	Acid	Alkaline
Albumin	Present	0	Present
Urea	23 per cent	4 per cent	½ per cent
Δ	—	—2.68	—5
Microscopical	Pus	Occasional red blood cells, no pus	Pus and a few red blood cells

Repeated examination for tubercle bacilli resulted in showing the presence of 1 or 2 of these. Further evidence was furnished by inoculating a guinea pig which after 25 days showed typical lesions from which the bacilli were recovered.

The nephrectomy performed by Dr J F Shepherd showed a very large kidney with small tubercles at both poles, the centre being free. On section the calices of upper pole were found to be badly ulcerated, the disease extending down on to the wall of the pelvis. The ureter was extremely thickened but did not appear tubercular microscopically.

CASE XI—H, aged 21, male—Dr G E Armstrong, September 14, 1907. Had had severe attacks of hæmaturia with

slight pain in the left side of the abdomen in front and right side of back for about one year. Had not lost weight. Blood had occasionally been seen in very large quantities. The urine now contains pus. Examination was negative except that the lower pole of the right kidney was palpable.

Phlorizin was administered and a cystoscopic examination made and the ureters catheterized. The urethra and bladder including the ureteral orifices were normal. A comparison of the urines showed

	COMMON	RIGHT	LEFT
Color	Turbid	Turbid	Darker
Reaction	Acid	Neutral	Alkaline
Specific gravity	1016	1007	1025
Urea	—	11 per cent	3 per cent
Albumin	Present	Present	
Sugar	—	Present	About twice quantity present in right
Δ	—	— 35	— 13
Microscopical	Pus and tubercle bacilli	Pus tubercle bacilli	No pus no tubercle bacilli

Consequently we concluded that the left side was sound the right tubercular. Nephrectomy showed a condition not unlike that of Case V viz. nothing on the outside of the kidney but one calyx where all the surrounding tissue was tubercular the disease spreading into the surrounding tissue to a depth of  $\frac{3}{4}$  to  $\frac{1}{4}$  inch the whole disease occupying about 9 cc of kidney tissue. This is another example of the extent to which a slight lesion may influence the function of a kidney. In consequence of removing so much secreting tissue we were not surprised to note a decided diminution in the amount of urine secreted post operation. This however rapidly increased to normal.

*To Summarize*—Case III is the only case in which symptoms or signs of any other focus of tuberculosis were to be found if we exclude Cases I V and VII where an epididymitis occurred some time subsequent to the primary renal symptoms and Case V where a periurethral abscess was the first sign though probably secondary to the kidney lesion. As



## SYNOPSIS OF CASES

Case	Time Elapsed Since First Symptoms	Earliest Symptoms	Loss of Weight	Hematuria	Pyuria	Frequency	Dysuria	Pain in Back	Other Organs Affected	Condition of Bladder	Tubercle Bacilli	Operation	Pathological Report	Remarks
I	3 years	Hematuria	+	+	+			+	Epididymis	Ulcer about ureteral orifice	Present	Nephrectomy	Macro- and microscopic, positive	Died later of military Tuberculosis
II	6-8 weeks	Pain in back No urinary complaints	+		+			+	None	Ulcer about ureter	Not found	Nephrectomy	Microscopic, positive	Well 1 year post-operation
III		Hematuria	+	+					Lungs	Normal	Present	None		Secondary to lung disease
IV	6 months	Frequency	+	+	+	+	+	+	None	Ulcer about ureter	Present	Nephrectomy	Macro- and microscopic, positive	Has gained greatly in weight
V	8 months	Frequency	+	+	+	+		+	Epididymis	Edema about ureter Tubercle	Present	Nephrectomy	Early tuberculosis	Has gained greatly in weight Well
VI		Pain in back	+		+	+	+	+	None	Cystitis Affected ureter not visible	Present	Nephrectomy	Small fibrosed tubercular kidney	Gained in weight, pain still present
VII	2 years	Hematuria, Fre- quency	+	+	+	+	+		Epididymis	Ulcer and edema of bladder wall	Present	None		Tuberculin injections
VIII	1 year	Pain	+	+	+			+	None	Ulcer about ureter	Present	Nephrectomy	Large caseous kidney	Very marked improvement
IX	3 months	Pain in side, renal colic	+	+	+			+	None	Edema about ureter	Not found	Nephrectomy	Early tuberculosis	
X	3 months	Pain in perineum	+		+				Periurethral abscess	Edema about ureter	Found after inoculation	Nephrectomy	Positive	
XI	1 year	Hematuria		+	+				None	Normal	Present	Nephrectomy	Early tuberculosis	

far as clinical evidence can be relied on this points to a primary renal tuberculosis. In 9 of the 11 cases tubercle bacilli were discovered in the urine immediately in 8 and through inoculation in Case X. Two cases were not operated upon all the remainder were verified micro and macroscopically. Nephrectomy was the only operation performed.

*Post Operation*—Case I in the course of some months developed a milary tuberculosis and died. Case VI still complained of pain in the back which possibly indicates some obscure bone focus otherwise he gained greatly in weight. Case IX developed immediately after operation a pleurisy of the affected side the nature of which is open to question.

Apart from the examination of the separated urines the cystoscopic examination showing the presence of ulceration tubercles or œdema about the ureteral orifices rendered us valuable assistance.

These cases have so strengthened our belief in the usefulness and accuracy of the cystoscope and ureteral catheter viewed from a diagnostic standpoint that we feel justified in going a step further and taking a more hopeful view of this malady. If we can make an early diagnosis of tuberculosis of the kidney and if this may be a unilateral primary disease as seems often to be the case then our prognosis should be better than it has been in the past. In the present instance we have purposely refrained from drawing conclusions as to the ultimate prognosis as some of the cases are still under observation and we feel that only observation over an extended period can justify such conclusions.

I have only to add my thanks to Drs Shepherd Armstrong Elder Finley Lafleur and v Eberts of the Montreal General Hospital for their reference of cases to me and their interest in this work and to Dr C W Duval for his assistance in the pathological study of the various lesions.

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# EXCISION OF THE WHOLE LEFT LOBE OF THE LIVER FOR SARCOMA

BY GASTON TORRANCE M D

OF BIRMINGHAM ALA

Site of St Vincent's Hospital

Mrs H G age 50 of German parentage consulted me first on August 16 1907 on account of a large tumor of the upper abdomen giving the following history Her mother died at the age of 65 of dropsy family history otherwise negative Her general health has always been good Menstruation began at 15 years of age and was regular and normal until she was 20 when she had a fall after this she menstruated every three weeks she was married at the age of 24 and continued to have the same menstrual trouble She has given birth to eighteen children and had five miscarriages has had twins twice and triplets once the first child was born one year after she was married and the youngest when she was 45 years old Nine of the children are still living Her last menstrual period occurred six weeks ago

There is no history of syphilis Her right eye was removed four or five years ago as the result of an injury received ten years previously Both lobes of her thyroid are considerably enlarged this was noticed soon after her marriage since which time there has been no marked increase in its size

Heart and lungs appear to be normal liver dulness begins at the upper border of the sixth rib and passes downward into the tumor dulness splenic dulness not increased Vaginal examination negative except for a slight laceration of the cervix and perineum

In the abdomen is a mass which lies transversely with the centre of the tumor almost under the navel and apparently adherent to the tissues beneath She first noticed a small mass in the left side about two years ago it was freely movable and gave her no trouble during the past year it has grown very rapidly and interferes with her digestion probably by pressure she does not have much discomfort from it now unless she strikes the abdomen The tumor measures  $21 \times 13$  cm is firm and rather irregular in outline the larger end lies towards the left side it is quite mov

able and the manipulations do not seem to cause any pain. Blood examination, hemoglobin 80 per cent, reds 3,712,000, whites 7,000, multinuclears 71 per cent, mononuclears 23 per cent, eosinophiles 3.5 per cent, lymphocytes 2.5 per cent.

Exploration advised. Five days later she was admitted to the private wards at St. Vincent's Hospital. On admission her pulse and temperature were both normal, a specimen of urine was examined and reported negative.

She stated that she had not been able to retain any food in her stomach since she had consulted me five days before and as a consequence was very much exhausted.

The following morning under ether an incision was made through the left rectus beginning just below the border of the ribs and extending down below the umbilicus, the tumor was easily delivered and some strong adhesions to the stomach were found, these were dissected loose and the raw surface of the stomach closed with some fine silk.

After consulting with several members of the staff who happened to be present, I decided to excise the whole tumor, mattress sutures were introduced by means of a blunt pointed liver needle, heavy linen being selected for suture material, after tying off a portion of the liver an incision was made through this part and sutures introduced and tied on the cut surface which almost approximated the peritoneal covering of the liver and completely controlled the hemorrhage, this method of tying and cutting was continued until the whole lobe had been severed, some of the larger vessels spurted and were caught with a Kocher hemostat and a small full curved needle passed through the liver tissue so as to catch them when tied.

The excision part of the operation took about thirty minutes.

The wound was perfectly dry when I had finished and the patient did not lose an ounce of blood in all, not including slightly more than this which regurgitated from the excised portion, but as sutures were introduced in this portion too the hemorrhage was very slight.

The omentum was tucked in around the cut surfaces of the liver and the wound closed without drainage, as practiced by Prof. Garré in the Breslau Klinik.

The patient's condition was not any worse at the end of the operation than when I began the excision.



FIG. 2



Salt solution was given by hypodermoclysis on the table and was continued by enema every three hours. Strychnin and digitalin were given by hypodermic. Her pulse was rapid and continued rapid but was of fair volume until a few hours before death which occurred twenty four hours after operation. She was stupid and was aroused with difficulty perhaps partly due to morphine. The excretion of urine was small and was not much increased by the hypodermic administration of sparteine sulphate. There was a terminal temperature of about 107 F. Unfortunately no post mortem was allowed.

The tumor weighed two pounds and nine ounces and measured 20 cm. across the upper surface and 43 cm. in circumference. The cut surface incised from before backwards measured 12 x 12½ cm. The upper surface showed a large area of thick fibrous tissue and at other places small nodules. The under surface showed a distinct mass which was very much softer and seemed to be cystic and when incised after being in formalin for about ten days a thick black grumous material flowed out leaving a distinct cavity.

The photographs (Figs. 1 and 2) show the cut surface and the extreme left end of the liver.

Pathological report by Dr. C. E. Dowman.

Three blocks of tissue were taken for microscopic examination. They were hardened in 5 per cent formalin, dehydrated in alcohol and ether and imbedded in celloidin.

Block No. 1 was taken from that portion of the tumor which shaded off into the liver substance. Sections stained with hæmatoxylin and eosin give the following microscopic picture: one half of the section is composed of somewhat altered liver substance, the lobules being irregularly cut up by strands of fibrous tissue. This fibrous tissue is so extensive in places—as we near the tumor portion of the section—that only here and there are present scattered columns of liver cells, the cells of these columns being considerably compressed. Scattered throughout this portion of the section between the columns of liver cells are numerous deep brown pigment cells. The formation of fibrous tissue increases as we approach the other half of the section. Here we have the picture of broad fibrous tissue bands which form an irregular mesh work around large alveoli filled with more or less pigmented palely staining spindle and round cells.



and large brown-black pigment cells. In most of the alveoli the spindle cells predominate, especially around the edges of the alveoli where they are in close relationship with the connective tissue bands. In other alveoli the formation of the pigment cells has so advanced that the other forms of cells, if they be present, are entirely obscured.

Block No. 2 was taken from a portion of the tumor where the pigmentation was not so pronounced as in most portions. The tissue here consisted macroscopically of very soft, greyish substance which suggested the predominance of cellular elements rather than of fibrous tissue bands. Celloidin sections stained with hæmatoxylin and eosin give the following microscopic picture, the alveolar arrangement described in block 1 is not present. The fibrous tissue bands are also less marked. The field consists chiefly of more or less connected tortuous collections of small and large round cells and spindle cells, whose nuclei take a deep hæmatoxylin stain. Between these tortuous collections of cells are faint strands of connective tissue with here and there scattered groupings of deep brown pigment cells. In one portion of the section the cellular elements have taken more of the eosin and very little of the hæmatoxylin stain, the picture suggesting a necrotic condition. Here the pigment cells are in great numbers. This condition increases as one approaches the edge of the section where the picture consists essentially of large and small, deep brown pigment cells and faintly staining spindle cells.

Block No. 3 was taken through the marked fibrous tissue thickening on the surface of the tumor and extending into the underlying deeply pigmented tumor substance. Sections stained with hæmatoxylin and eosin show microscopically, the thickened outer capsule of the tumor to consist of dense fibrous and elastic tissue. From this capsule, extending downward into the main portion of the tumor, are wide fibrous tissue bands, in the network of which are large irregularly formed alveoli filled with spindle, round and pigment cells as described in block 1. Here the spindle and pigment cells predominate, the former being of all types from the short spindle to the long fibrous cell form, while the latter are brown-black round cells, of various sizes and grouped in great density between the various collections of spindle cells.

*Diagnosis*—Melanotic sarcoma, probably metastatic

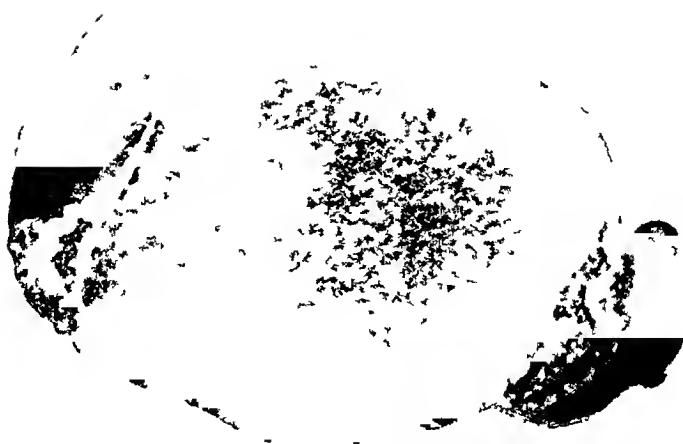


FIG. 1



Lacerated spleen inner surface

FIG. 2



Lacerated spleen outer surface

# SPLENECTOMY FOR LACERATED SPLEEN AFTER BLOOD TRANSFUSION

BY ARTHUR H. BOGART, M.D.

OF BROOKLYN, N. Y.

Senior at the Methodist Episcopal Hospital

G. S., aged 8 years, was admitted to the Methodist Episcopal Hospital with a history of having been run over by a truck. Upon admission he was found to be in a condition of profound shock but still conscious and complaining of severe abdominal pain. His temperature was 96° F., pulse imperceptible at the wrist, respiration 40 and shallow. Heart sounds rapid and feeble. The skin and mucous membranes were pale and cold, the superficial veins over the upper portion of the body markedly dilated.

Examination revealed an extensive ecchymosis over the left tenth rib in the post-axillary line. The abdomen was tender, rigid and dull on percussion in both flanks, but the condition of general profound depression was so marked as to be negative for the time any operative interference. Dr. Crile of Cleveland was visiting the hospital at the time the boy was brought in and who saw the case with the writer considered it a favorable one for transfusion and very kindly consented to demonstrate his method. The mother of the patient was secured as the donor and at the end of thirty-eight minutes the patient's pulse had dropped from 140 to 110 and had increased in force and volume, his color had improved and his general condition became such as to warrant an exploratory abdominal incision which was made.

Upon opening the abdomen it was found to contain considerable free blood due to a lacerated spleen (see plate Figs. 1 and 2) the pedicle of which was ligated and the organ removed. The cavity was then sponged out and the wound rapidly closed with through and through sutures of silkworm gut.

The patient bore the operation well, his condition being quite as satisfactory at its conclusion as when it was begun. He began to sink rapidly, however, and died three and a half hours later. At the post-mortem examination there was found an extensive retroperitoneal hemorrhage due to a rupture of the left renal vein and several small lacerations of the liver.

# SPLENECTOMY FOR GUNSHOT WOUND OF THE SPLEEN.

BY EDWIN H FISKE, M D,

OF BROOKLYN, N Y,

Assistant Surgeon to the Kings County Hospital

R B, aged 25 years, a bartender by occupation, was admitted to Kings County Hospital at 6 30 P M August 28, 1907, with the following history One hour before admission to hospital, patient was shot in the back, during an altercation Examination showed a wound about  $\frac{3}{8}$  inch in diameter, in left posterior axillary line, at tenth intercostal space

General condition fair, conscious, but restless, face somewhat blanched, expression anxious, respirations rapid, but regular, 26 per minute Conjunctivæ slightly pale, mucous membranes likewise anæmic, though not markedly so He complained only of pain beginning posteriorly over subscapular region, and extending into left epigastric and left hypochondriac regions Pulse 108, regular, of only fair volume Temperature 99° F Heart and lungs negative, no dulness at base of left lung, respiratory sounds normal

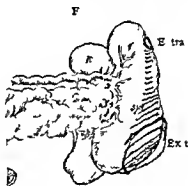
Abdomen somewhat distended, tenderness general, but marked in left epigastric and particularly so on deep pressure under chondral borders over splenic area, slight rigidity of left rectus, no tumefaction Percussion showed flatness in left lumbar region in recumbent position, in lateral recumbent flatness gave place to tympany During examination patient complained of thirst, and pulse increased to 115, and seemed of less volume

A diagnosis of intra-abdominal hemorrhage, with possible splenic injury was made, the patient was quickly prepared for operation and brought to operating room

*Operation*—Dr Fiske, assisted by Dr Canna and house staff Under ether narcosis, with large pointed probe, the wound of entrance was probed, the course was directed downward and forward and inward to upper border of eleventh rib, where the probe was arrested and not pursued further

An incision over outer border of left rectus was made, extending from costal margin down to a point midway between

umbilicus and symphysis On opening peritoneum about one pint and a half of blood escaped followed by several small clots but without gas fæces or gastric contents the stomach and intestines were carefully examined without result excepting a punctured wound of transverse mesocolon a short distance (1 inch) from gut This wound was repaired and as blood continued to well up the spleen was rendered more accessible by a transverse incision running outward at right angle to the one parallel to outer border of rectus from about its centre The hand was then able to grasp the spleen in which a wound admitting two (2) fingers could be felt It was impossible to expose spleen to field of vision because of incomplete anæsthesia and intestinal disten-



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tion The ligaments of spleen were separated by dissection with fingers and spleen brought up into wound it was now evident that the injury was one necessitating removal of the organ The pedicle was ligated en masse being previously clamped and the spleen then removed The individual vessels in the pedicle were ligated separately Bleeding having ceased the stump was returned to the cavity and the abdomen flushed with normal saline solution a small iodoform drain was inserted down to the pedicle and the wound closed by through and through silkworm gut sutures excepting at the upper end where only enough space was left to allow the exit of the drain

The patient was given 1 pint of normal saline solution containing 0.1 of sol adrenalin intravenously the wound dressed and patient returned to the ward in good condition

On the following day the patient complained of slight pain

in the operative region, no other abdominal tenderness, no rigidity, no vomiting Pulse 115, but of good volume, temperature 100, respiration 30

Patient made thereafter an uneventful recovery On September 2nd the drain was removed, the wound was clean, and the dressings were reapplied without drain

September 5th, several stitches removed, wound healed primarily

September 7th, all sutures removed

September 11th, patient out of bed

September 22nd, patient left hospital, completely recovered

Radiograph taken shortly before discharge from hospital, showed the bullet in the pelvis

# SPLENECTOMY IN BANTI'S DISEASE

WITH REPORT OF A CASE.

BY GASTON TORRANCE M.D.

OF BIRMINGHAM, ALA.

S. g. on t St V t d th H l l m H o s p i t a l

BANTI the Italian pathologist first described in 1882 the syndrome which bears his name. The spleen becomes enlarged without known cause, is firmer than normal but still preserves its normal contour. A progressive anaemia develops later with occasional periods of remission. The skin becomes bronzed or pigmented with some jaundice. This may be called the first stage and in some cases lasts from 3 to 10 years or longer.

The second stage may last only a few months; the urine becomes scanty, high colored, loaded with urates and contains urobilin.

In the third stage we have ascites with Laennec's cirrhosis.

*Etiology*—Barr says it is probably due to a vaso motor paresis of the splanchnic area, either in whole or in part arising from disease of the visceral sympathetic ganglia. As a consequence there is a great engorgement of the abdominal viscera, and especially the spleen and the liver, and increased hemolysis with consequent oligochromemia and oligocythemia. The increased blood supply to these organs leads to fibrosis and lessened function. The peritoneal effusion is due rather to vascularity than to portal obstruction.

Harris and Herzog think the enlarged spleen is responsible for the destruction of the red cells and advance the theory that there is an erythrolytic enzyme secreted by the increased numbers of endothelial cells found in these spleens and feel that this view is substantiated by the fact that there is an immediate improvement in the blood picture after removal of the spleen.

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Read before the Section of Surgery of The Southern Medical Association, September 24, 1907.



*Symptoms* —Cardiac palpitation on exertion with a feeling of unusual muscular fatigue may be the first symptoms noticed. There may be headache and slight pallor of the mucous membrane. After a few months the patient's attention is attracted by a tumor in the left hypochondriac region and there may be a sense of weight or tension. Soon afterwards nausea and vomiting and at times a persistent diarrhoea may occur.

Headache and dizziness may be troublesome. Epistaxis is a common early symptom. There may be cutaneous hemorrhages or bleeding from the gums or other mucous membranes. There is a progressive anæmia with pigmentation or bronzing of the skin and some jaundice.

Abdominal pain with distension of the stomach and bowels, dyspnoea, dysuria, cramps in the legs, etc., are common symptoms.

*Pathology* —The normal spleen weighs 200 grammes and measures 12 x 8 x 3 cm. The changes in the spleen are fairly uniform and consist in great enlargement, sclerosis of the capsule and reticulum, sclerosis and atrophy of the Malpighian corpuscles (a marked point of differentiation from leukaemia, in which the Malpighian bodies are increased—Cabot), and atrophy of the pulp. In other cases the normal texture is largely replaced by fibrous tissue and large endothelial cells, with clear protoplasm, containing two or more nuclei. The splenic veins are markedly sclerosed.

The lymph glands are as a rule not enlarged. There is usually an increase in the marrow of the long bones, in some cases it is fatty and in others there is a red atrophy.

The liver shows slight increase in its interlobular connective tissue. Infiltration of round cells is observed about the portal vessels and between the lobules. Banti has reported a case in which there was considerable increase in the connective tissue, which he described as a perilobular hepatitis.

*The Blood* —The coagulability is much reduced. The red cells are as a rule reduced, ranging from 4,000,000 to 568,000. The corpuscles are pale. Neucleated reds have not

been found. Rouleaux formation is absent in the later stages. The hæmoglobin is reduced. The white cells are not increased as a rule. The relation of the different forms is not disturbed. No abnormal elements have been recorded. A few cases have been reported in which there was a leucocytosis. The color index is lowered.

CASE I—SPENCER WELLS in 1865 operated upon a woman 34 years of age who had a marked anæmia with slight increase of the whites resulting fatally. The spleen weighed 2672 grammes.

CASE II—PEAN in 1876 removed the spleen of a woman 24 years of age. She first noticed the tumor eighteen months and the anæmia six months previously. The anæmia progressed steadily. There was great disturbance of digestion, severe neuralgic pains, hæmoptysis, hæmatemesis, hæmaturia and bloody stools. No leucocytosis. The spleen weighed 1125 grammes. The patient recovered perfectly in a month's time but died later of a toxic enteritis.

CASE III—CZERNY in 1878 removed a large spleen from a woman 34 years of age. She was anæmic, had digestive and menstrual disturbance and her general health was poor. No leucocytosis. Spleen measured  $23 \times 12 \times 8$  cm. She made a complete recovery.

CASE IV—FRANZOLINI in 1881 operated upon a woman 22 years of age removing a spleen weighing 1526 grammes with a complete recovery. Her health had never been good, she had suffered from edema and ascites at 12 years of age from which she recovered. She began to have pain in the region of the spleen two years before operation. Her suffering and anæmia increased. There was great muscular fatigue and obstinate vomiting. Leucocytosis was increased five times the normal. After operation her suffering ceased and a month later the whites were reduced to one half the number found at the time of operation. This case was reported as a leukæmia but was not so considered by Banti and Sippy.

CASE V—FRASCAVI removed the spleen of a girl 16 years of age resulting fatally in four hours from hemorrhage. She had noticed the tumor two years before and during this time had occasional attacks of epistaxis, fever and diarrhœa. The anæmia was

noticed one year later and was marked at the time of operation. There was also edema and ascites. Hæmoglobin 68 per cent, reds 3,900,000, whites 7,030. Some glandular enlargement. The spleen weighed 1310 and the liver 1050 grammes.

CASE VI — In 1892 LINDRORS removed the spleen of a female 22 years of age who had noticed a tumor five years before. She was quite anæmic. Red corpuscles much reduced and the hæmoglobin markedly so. The relation of the white corpuscles to the reds 1 to 250. The spleen measured 25 x 15 x 7 cm. The patient recovered.

CASE VII — CECI, in 1893, removed the spleen of a girl 13 years of age with recovery. Her trouble began two years before with anæmia and tendency to hemorrhages from the gums. She was quite thin with muscular weakness. Hæmoglobin 65 per cent, reds 3,592,000, whites 15,000. Weight of spleen 1300 grammes.

CASE VIII — COLZI operated upon a woman who died several days afterwards from a septic puerperal complication.

CASE IX — COLZI operated upon a young man who was in perfect health nearly three years afterwards.

CASE X — COLZI's third case was a woman who was reported in good health nearly two years after operation. No anæmia.

CASE XI — PICOU and RAYMOND in 1896 reported the case of a woman 32 years of age who had menorrhagia for a year and the enlarged spleen was mistaken for a uterine fibroid. The other symptoms were vague abdominal pains extending into the lower extremities, swollen and bleeding gums, some digestive disturbance and edema of the ankles. The blood changes were those found in simple anæmia. Weight of spleen 2800 grammes, measurements 26.5 x 14.2 x 9 cm.

CASE XII — CUSHING in 1898 removed the spleen of a man 33 years of age. He made a good recovery and gained 30 pounds in weight. He was reported living and well eight years later with no return of the hemorrhages.

CASE XIII — HALSTED in 1898 operated upon a case reported by Osler, the patient was a man, 33 years of age, whose trouble began ten years before. He had hæmatemesis and bloody stools. Hæmoglobin only 25 per cent, reds 3,000,000 and whites 2,800, multinuclears 84.4 per cent, large and small mononuclears 9.4 per cent, transitionals 3 per cent, eosinophiles 2.8 per cent. He

made a good recovery and continued well when heard from a year later

CASE XIV—D ARCEY POWER operated upon a woman 43 years of age in 1899 Three and a half years previous to this time she had struck her side over the region of the spleen two years later she noticed that the lower part of her abdomen was increasing in size When operated upon the spleen was found to be suspended by a pedicle four inches long made up of fatty connective tissue with enlarged veins and splenic artery The spleen weighed 17 to 18 ounces after having been in alcohol for six months Blood examination made eight days after operation showed reds 4 230 000 whites 17 000 polynuclears 65 5 per cent lymphocytes 18 75 per cent large mononuclears 12 5 per cent eosinophiles 3 5 per cent She made a good recovery

CASE XV—BOVAIRD'S case operated upon by A J McCosh in May 1899 was a girl 16 years of age Thirteen years before her mother had noticed an enlargement of the abdomen which had steadily increased Her face and hands became deeply bronzed Blood examination at this time showed reds 3 550 000 whites 7 000 large lymphocytes 15 per cent normal 4-8 per cent small lymphocytes 21 per cent normal 35 per cent multinuclears 62 per cent normal 62-70 per cent eosinophiles 1.4 per cent normal  $\frac{1}{2}$ -4 per cent Weight of spleen  $2\frac{1}{2}$  pounds The patient died three hours after operation

CASE XVI—HARRIS and HETZOG report a case operated upon in May 1899 The patient was a female 22 years of age when eleven years old she fell from a swing she was in good health for two years when she began to have some discomfort about the stomach and accidentally discovered a tumor in the left side of the abdomen Six months later she had an illness with severe hæmatemesis abdominal distension and fever lasting three months Two and a half years later had another hemorrhage from the stomach Menstruation began at 17 and was regular and normal From this time on her health became gradually worse Three months before operation she had a severe illness with marked pain in the upper part of the spleen with abdominal distension and it is very probable that an infarct which was found in the spleen at operation occurred at this time A brownish pigmentation of the skin was found and especially of the face, neck and arms and abdomen Hemoglobin 40 per cent reds

2,631,000, whites 2650, at end of 2nd day 15,000, 3rd day 11,560, 17th day 5,688 Eosinophiles at the end of 7th month 14.4 per cent, 20th month 11.4 per cent The urea was increased about 4 grammes daily after operation Temperature 103.8 F on the third day and ranged from 99 to 102 for two weeks She gained 25 pounds in three months and went back to work She had a return of the gastric symptoms about four months after operation but made a good recovery and was in good health about two years after operation and the skin was clearing up Weight of spleen 1055 grammes Measurements  $21 \times 13.5 \times 7$  cm

CASE XVII—NANCREDE operated upon a man 41 years of age in November, 1899 The portal vein was found to be partially closed by a fibrous valve containing calcareous plates The splenic and mesenteric veins were very much distended and their walls much thickened Weight of spleen 1536 grammes The patient did not recover

CASE XVIII—HARRIS and HERZOG operated upon a man 47 years of age in September, 1900 Nine months previous to this time he began to have pain in the umbilical and epigastric regions with loss of weight, 30 or 40 pounds The skin was of a dirty yellow color but there was no pigmentation Spleen much enlarged but there was no enlargement of the liver or glands Hæmoglobin 50 per cent, reds 3,364,000, whites 28,200, color index 0.74 There was an increase of polynuclears, no plasmodia Three weeks after operation hæmoglobin  $62\frac{1}{2}$  per cent, whites had decreased 4,000 No increase of eosinophiles Weight of spleen after having been hardened in formalin 600 grammes Measurements  $18 \times 12 \times 6$  cm He made a good recovery and was doing well when heard from last and was attending to business

CASE XIX—J COLLINS WARREN removed the spleen of a man 26 years of age in 1900 Two years previous to this time he began to have diarrhoea and suffered with distress after eating and vomiting He improved under treatment but had a recurrence every few months About a year later he noticed a tumor in the left side about the size of a grape fruit He lost weight and at the time of operation had dyspnoea on exertion and was unable to attend to his business Hæmoglobin 65 per cent, reds 5,200,000, whites 2,200, multinuclears 70 per cent, lymphocytes 22 per cent, eosinophiles 3 per cent, megaloblasts 0.7 per cent, normo-

blasts 01 per cent Two days after operation the whites increased to 24 000 Weight of spleen 1155 grammes Measurements 21 x 16 x 8 cm He made a good recovery and is reported perfectly well and attending to business six and a half years later

CASE XX — JAFFE reports a successful case in 1900 operated upon in the last stages with an enormous amount of ascites The liver was found to be cirrhotic and he suggests that Talma's operation should be done at the same time There was a wonderful improvement in the patient's condition notwithstanding the cirrhosis of the liver

CASE XXI — TSCHERNIACHOWSKI reports the case of a female aged 25 years in whom the splenic enlargement had been diagnosed essential hypertrophy and had existed five years increasing in size and the patient losing strength in spite of all treatment There was a complete recovery

CASE XXII — CUSHING operated upon a man 38 years of age in 1900 who died ten days later from the rupture of an œsophageal varix

CASES XXIII and XXIV — ARMSTRONG quotes two cases operated upon by Mayo Both recovered one was living nine months after operation and the other died a year later cause of death not given

CASE XXV — W S HALSTED in 1901 operated upon a man 30 years of age the patient died of hemorrhage on the table

CASE XXVI — BEVAN'S patient died from hemorrhage and shock a few hours after operation Large calcareous plaques were found around the spleen and especially between it and the diaphragm with numerous adhesions

CASE XXVII — GORDON removed the spleen of a man 45 years of age in June 1902 weighing 3635 grammes with recovery He was reported to be in perfect health seven months later and had gained 28 pounds Hæmoglobin 85 per cent reds 4 000 000 whites 6 600

CASE XXVIII — JONAS operated upon a man 39 years of age in 1902 who had first noticed an enlargement of the left side 18 months before There was no impairment of digestion Some large veins were noticed on the left side of the abdomen No hemorrhages The liver extended about two inches below the border of the ribs There was a bronzed condition of the skin of the chest back abdomen and parts of the thighs No pig-

mentation Hæmoglobin 60 per cent , reds 4,500,000 , whites 25,000 Some accessory spleens were found at the operation and were left. The fresh spleen weighed  $7\frac{3}{4}$  pounds Measurements  $18\frac{3}{4} \times 12\frac{3}{4} \times 8\frac{1}{2}$  inches Infarcts varying from the size of a pea to a walnut were found The patient made an uninterrupted recovery and was reported well two years later

CASE XXIX —CLARKE in January, 1904, removed the spleen of a *colored* woman 21 years of age, weighing 1230 grammes Armstrong quotes a letter from Dr Stengel dated July, 1906, in which he says she is quite well and that her condition is practically normal

CASE XXX —LESPEYRES operated upon a female 32 years of age, in 1904, with recovery Some cachexia and anæmia persisted five months later

CASE XXXI —HART removed the spleen of a boy 14 years of age in 1904 He made a good recovery and was reported perfectly well two years later and able to run an automobile, swim and row

CASE XXXII —KONIG, in February, 1904, removed the spleen of a boy 15 years of age which weighed 1300 grammes The jaundice had almost disappeared in twelve days and the liver which was much enlarged at the time of operation seemed normal at the end of three weeks

CASE XXXIII —HARRIS removed the spleen of a man 60 years of age in April, 1906 He died a few hours after operation There was great enlargement of the splenic veins

CASE XXXIV —G E ARMSTRONG of Montreal, in January, 1906, operated upon a man 26 years of age who five years previously was struck by the elbow of a companion in the region of the spleen and afterwards vomited some dark material Tenderness persisted for ten days and the spleen became enlarged He was examined by Dr Osler two years later and he found some enlargement of the left lobe of the liver and considered it a case in the early stages of Banti's disease Blood examination at this time, hæmoglobin 90 per cent , reds 4,700,000 , whites 5,000 , multinuclears 80 per cent , large and small mononuclears 15 per cent , eosinophiles 2 per cent , transitionals 3 per cent

Dr Stengel saw him about two months before operation and considered it a case of Banti's disease and advised splenectomy He had been slightly jaundiced for some months and had consid-

erable digestive disturbance Weight of spleen 1000 grammes Measurements  $22 \times 13 \times 8$  cm He was reported in perfect health nine months after operation with normal blood count and no appreciable alteration in the size of the liver

CASE XXXV—W P CARR operated upon a man 49 years of age in July 1906 with great enlargement of the spleen and slight enlargement of the liver His health had not been good for a number of years and he had lost considerably in weight About eighteen months previously he had fallen and struck his abdomen over the region of the spleen on the end gate of a wagon and was unable to turn himself in bed for six weeks Has had severe diarrhoea but no hemorrhages No blood examinations were made Microscopically the spleen showed increase of connective tissue and Malpighian bodies He made a good recovery and was reported in good health several months later with no return of the diarrhoea

CASE XXXVI—Author's case was operated upon in February 1907 The patient was a female 35 years of age the mother of five children Her general health has always been good No history of malaria or syphilis For the past year has had more or less digestive trouble some nausea considerable gas distension of the stomach and bowels Bowels constipated The symptoms that first attracted her attention were headache pain in the back and in the left side—there has been a sense of weight and dragging in this region The tumor was first noticed about nine months ago She was being treated for kidney trouble There has been considerable muscular weakness and she has been unable to attend to her household affairs with any degree of comfort and is scarcely able to go up town No hemorrhages Slight enlargement of the liver The splenic dulness extends from the upper border of the ninth rib down almost to the crest of the ilium The spleen cannot be felt through the vagina Some tenderness in the region of the spleen Skin has a yellow dirty color slightly bronzed The urine was negative except for a slight bile reaction and high specific gravity As there was some question about the tumor being the spleen the urine was segregated and both kidneys found to be functioning normally and about equally Sahli's Iodoform Glutoid Kapsulen was given to test the function of the pancreas

Blood examination Hæmoglobin 8 $\frac{1}{2}$  per cent reds 4,800



000, whites 8,000, multinuclears 75 per cent, lymphocytes 20 per cent, large mononuclears 4 per cent, transitionals 1 per cent. Under ether an incision was made beginning at the lower border of the twelfth rib and running down in front of the anterior superior spine of the ilium, the kidney was found to be in its normal position and the peritoneum was opened and the spleen found to have some adhesions anteriorly which were divided between ligatures and the spleen delivered and the pedicle tied with a heavy linen ligature, a portion of the spleen tissue was left to prevent the slipping of the ligatures. There was no hemorrhage and the wound was closed in tiers with heavy chromic cat gut. The wound healed kindly and she had no discomfort for two weeks when she began to complain of pain in the abdomen and legs. Her pulse became more rapid and her temperature ran up from normal to 101.4 F and she seemed to be rather weaker. She was immediately put on extract of red bone marrow and in the absence of any extract of spleen the fresh spleens of the cow and sheep were given twice daily. Later we gave Armour's extract of spleen three grains after meals. Her temperature was normal in about a week and the pains in her abdomen and legs had about disappeared.

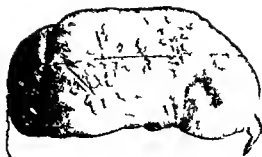
The extract of spleen was kept up for a month or six weeks. Blood count three weeks after operation: hæmoglobin 80 per cent, reds 3,246,000, whites 6,000, multinuclears 76 per cent, large mononuclears 11 per cent, transitionals 9 per cent, eosinophiles 4 per cent. Her digestion soon became normal and she has not been troubled with the flatulence any more.

Her skin has cleared up and she seems to be perfectly well and normal and has gained 15 or 20 pounds and is probably pregnant now, seven months after operation.

The spleen measures 15 x 8 x 7 cm. There is a large fibrous growth involving about three-fourths of the capsule on the outer surface and in places is almost a centimeter in thickness as shown in the photograph (Figs 1 and 2). On section this part was very hard and the spleen tissue seemed harder to cut than in a normal spleen.

Dr Jas S McLester gives the following pathological report: A specimen of tissue from the spleen which you sent was frozen for sectioning, fixed in formalin and stained in hæmatoxylin-eosin, and presents the following

F 1



F 1 ged plee m d

F



F 12 ged plee sec. sored



The capsule is greatly thickened being in places fully a half centimeter in thickness. Throughout the entire organ is seen a pronounced increase of fibrous tissue the trabeculae are thickened throughout and the Malpighian bodies are smaller than normal they also show an increase of the fibrous tissue.

No proliferation of the endothelial cells is seen.

The blood vessels are larger and more numerous than in the normal organ.

TABLE OF CASES REPORTED UP TO THIS TIME.

Date	No	Operator	Sex	Age	Result
1865	1	Spencer Wells	F	34	Death
1876	2	Pean	F	24	Recovery
1878	3	Czerny	F	34	
1881	4	Franzolini	F	2	
—	5	Frascani	F	16	Death
1892	6	Lindfors	F	22	Recovery
1893	7	Ceci	F	13	
—	8	Colzi	F	—	Death
—	9	Colzi	M	young	Recovery
—	10	Colzi	F	—	
1896	11	Picou and Raymond	F	3	
1898	1	Cushing	M	33	
1898	13	Halsted (Osler's case)	M	33	
1899	14	D Arcey Power	F	43	
1899	15	McCosh (Bovaird's case)	F	16	Death
1899	16	Harris and Herzog	F	22	Recovery
1899	17	Nancrede	M	41	Death
1900	18	Harris and Herzog	M	47	Recovery
1900	19	J Collins Warren	M	26	"
1900	20	Jaffé	—	—	
—	21	Tscherniacho vski	F	2	
1900	22	Cushing	M	38	Death
—	23	Mayo	—	—	Recovery
—	24	Mayo	—	—	
1901	25	Halsted	M	30	Death
—	26	Devan	—	—	
1902	7	Gordon	M	45	Recovery
1902	8	Jonas	M	39	
1904	29	Clarke (colored patient)	F	21	
1904	30	Le pyres	F	32	
	31	Hart	M	14	
	3	Kong	M	15	"
1906	33	Harris	M	60	Death
	34	Armstrong	M	26	Recovery
"	35	Carr	M	42	"
1907	36	Torrance	F	35	"

*Analysis of Cases*—Of the thirty-six cases reported above 9 died, a mortality of 25 per cent, 17 or 47 per cent were females, 15 or 42 per cent were males; in 4 or 11 per cent the sex was not given. Under 20 years of age 5 or 13.9 per cent, between 20 and 40 years 18 or 50 per cent, between 40 and 60 years 6 or 16.6 per cent, age not given 7 or 19.5 per cent. Total 36 or 100 per cent.

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## SPLENECTOMY FOR CARCINOMA

BY MARY ALMIRA SMITH M.D.,

OF BOSTON MASS

CANCER of the spleen is of such rare occurrence that it would seem desirable to place every case on record especially if an operation be performed

The task of looking up the bibliography of this subject has been greatly lightened by use of the very thorough record of splenectomies done for all causes both in this and foreign countries compiled by Dr J H Carstens of Detroit whose monograph appeared in 1905 Among over 700 cases he found only 25 operations for malignant growths of which 22 were for sarcoma and 3 for carcinoma

Since January 1 1905 I can find only one splenectomy for malignant growth recorded and that a sarcoma so that the case I am about to relate appears to be the fourth splenectomy for carcinoma on record

Mrs F W American 49 years old Nothing of special note in either the family or personal history Married in 1894 One child born fifteen months later After confinement the abdomen did not return to its natural size and patient complained of a dragging sensation and became easily fatigued

In May 1897 she first noticed a tumor in the abdomen which increased rapidly in size during the next three months and became very sensitive This led to her consulting me in August 1897 A diagnosis was made of multilocular right ovarian cyst and an operation was performed August 21 1897 Immediately upon opening the peritoneum there gushed forth a considerable quantity of a transparent gelatinous fluid mixed with shreds of reddish tissue Then the ovarian cyst was encountered with the right fallopian tube spread out over it The cyst wall was very thin and friable tearing easily The walls of the septa were partly smooth and partly covered with a proliferating papillomatous growth The cavities of the tumor were filled with the same gelatinous fluid clear and transparent in some greenish

or dark brown in others. In all nine pints of this colloid material was removed, together with the sac. Upon examination the left ovary and tube were found to be in a beginning stage of the same disease, likewise the vermiform appendix. All were removed. The tip of the appendix was so transparent, that after its removal a probe passed into its lumen was plainly visible. The peritoneum was throughout thickened, and vascular, and it, as well as the uterus and intestines, were profusely studded with a growth resembling wet sago grains. The abdomen was washed out with normal salt solution, and then closed with layer sutures without drainage. The microscopical examination gave a diagnosis of proliferating cyst adenoma of both ovaries of malignant type.

The wound healed by first intention. There was considerable digestive disturbance following the operation, necessitating rectal feeding for a time. Patient left the hospital in thirty-five days, and at home gained slowly but steadily.

In spite of the unfavorable prognosis given, nothing further was heard from the patient till March of this year, ten years later, when she returned complaining of pain in the left side, rapid emaciation, and loss of strength. In January, 1906, she had noticed a lump, size of an egg, in the epigastric region, in connection with some digestive disturbance. Under medication by her local physician the digestion had improved, and not till a year later, January, 1907, did the tumor grow very much, but since then very rapidly. Upon examination I found a large, firm, nodular, rather immobile mass, extending on the left side to the diaphragm and pushing the lower ribs outward and upward. The tumor filled the whole left side, with dulness extending from a little to the right of umbilicus in front, around to the spine, and as low down as the anterior spinal process of ilium. It moved slightly up and down with each respiration. The whole abdomen was sensitive to touch.

The urine was normal except for a few hyaline casts—*Blood examination*—Reds, 5,500,000, whites, 8,500, hemoglobin, 70 per cent. *Differential count*—Polymorphonuclears, 73 per cent, small mononuclears, 4 per cent, large mononuclears, 9 per cent, transitionals, 2 per cent, eosinophiles, 2 per cent.

The diagnosis lay between a probably malignant growth of the spleen or left kidney. Operation was performed on March

28 1907 The kidneys liver and intestines were found in apparently normal condition except that the transverse colon and a coil of small intestine were adherent to the tumor which was the enlarged spleen Posteriorly there were adhesions to the abdominal wall and diaphragm

All the adhesions were gradually released ligatures being applied as needed Spleen was then lifted out of the abdomen the splenic vessels were tied and severed

Careful examination could find no trace of the sago-like growth which was so universally present at the first operation ten years before nor of any metastasis in the other abdominal organs The wound healed by first intention and the convalescence was uneventful

*Pathologist's Report* by DR. ELIZABETH MORSE. Specimen is a greatly enlarged spleen weighing 410 gms and measuring  $6.5 \times 14.5 \times 10$  cm The contour is preserved and some splenic tissue remains along the convex border and at the upper pole. The rest of the organ forms externally a yellowish white nodular mass mottled with hemorrhagic areas

On section it is found that the entire organ is converted into a tumor mass surrounded by a rim of splenic tissue  $\frac{1}{2}$ -1 cm. thick. The growth has broken through the capsule near the hilus and presents papillary excrescences on the surface. It is not encapsulated but it can easily be torn away from the splenic tissue. The cut surface is yellowish translucent and coarsely granular giving somewhat the appearance of sago. The tumor appears to be made up of large alveoli filled with gelatinous material and separated by broad trabeculae. It is friable in consistence and small mucoid granules can be expressed from the cut surface.

Microscopically the tumor is composed of large alveoli filled with epithelial cells which are surrounded by colloid material. Almost the entire growth has undergone colloid degeneration only a few well preserved alveoli remaining at the periphery. The tumor cells show little variation in form. They are round or low-cylindrical indefinite in outline and closely packed together. The nucleus is vesicular and relatively large the cytoplasm is small in amount. Mitoses are numerous four or five being sometimes counted in one high power field. Many of the cells in the partially degenerated areas contain clear droplets.

The splenic tissue at the edge of the tumor shows a great increase in the connective tissue with hemorrhage both old and recent and round celled infiltration. Elsewhere the lymphoid tissue is decreased in amount. The connective tissue of the pulp is prominent and the capillaries are dilated.

*Diagnosis*—Colloid carcinoma metastasizing to the spleen



The publication of this case has been purposely delayed pending the final outcome of the same

Patient remained in very good health for four months, spending the summer in a camp and attending to all her family duties. In August the abdomen began again to increase rapidly in size, and she returned to the hospital. A small incision in the abdominal wall permitted the escape of a considerable quantity of free fluid, and the flushing of the cavity with normal salt solution. It was then noted that there were numerous small nodules of the same semisolid growth in the omentum, and in various parts of the parietal peritoneum. Although provision was made for permanent drainage, there was very little subsequent secretion of fluid, but a very rapid increase of the colloid growths, with increasing dyspnoea and exhaustion, till the end came rather suddenly on October 25th, seven months after the splenectomy.

The points of special interest are

- 1 The probable development of the ovarian tumors either during or soon after the pregnancy
- 2 The long interval of good health following the removal of the ovarian tumors and appendix vermiformis
- 3 The entire disappearance of the sago-like growth observed at the first operation, and the appearance of a similar growth in the spleen—replacing the splenic tissue except for a slight rim
- 4 That the same colloid growth reappeared in the abdomen after the splenectomy, doubtless taking its origin from that part of the spleen where the growth had burst through the capsule
- 5 That the blood showed such slight variations, both before and after operation
- 6 That there were no symptoms pointing to any special organ as the cause of the rapid emaciation and loss of strength

# GANGRENE OF APPENDIX IN A THREE WEEKS OLD INFANT

BY CHARLES H DIXON M D

OF ST LOUIS MO

THE rare occurrence of trouble in and about the appendix in the very young is the reason for reporting this case

Baby S an eight months baby twenty four days old was taken with severe pains and said to have cried most of night and morning Had had no stool for twenty hours and no passing of flatus I was called early in the afternoon and found him suffering from a strangulated right inguinal hernia Operated on at once and found part of cecum and about 8 cm of ilium in sac together with the appendix which was adherent and gangrenous The appendix was removed the gut returned and a radical operation to overcome the hernia performed

The appendix being adherent in the sac was undoubtedly the cause of the cecum and ilium being drawn down The mother states that the baby had suffered very much from attacks of colic also that the motion of the child in utero the last two weeks was very much greater and lasted longer than at any other times

Was the appendix attached in the canal in utero? Did it cause increased peristalsis causing excessive motion in utero producing early labor also the attacks of colic after birth?

The baby has had little or no colic since the operation and has steadily gained in weight

This is the earliest case of appendix trouble on record and though the gangrenous appendix was due to the strangulation of the gut the hernia was no doubt caused by the attached appendix

# PRIMARY SARCOMA OF THE PROSTATE<sup>\*</sup>

BY CHARLES A. POWERS, M.D.,

OF DENVER, COLO

Professor of Surgery in the University of Denver

Mr. A., of Cheyenne, a man of 60 years, consulted me February 7, 1907, regarding a rapidly increasing difficulty in urination. He had been an unusually strong and healthy man. He stated that he never had any sort of bladder trouble until two months before at which time he began to notice a little pain and discomfort on urination and began to rise in the night to urinate. The symptoms rapidly increased and coincidentally he lost flesh and strength.

*Examination*—The man is five feet and nine inches in height, he weighs 180 pounds, having lost 25 pounds during the last two months. He complains of constant, severe pain in the hypogastric region and a constant pain which is less severe in the recto-perineal region. He urinates about every 1½ hours, day and night, urination being attended by increasing difficulty and pain. The urine is entirely normal. Catheterization finds no residual urine whatever, both soft rubber catheter and ordinary searcher pass easily to the bladder, no stone is found. Rectal examination reveals a very large, rounded, slightly nodular, balloon-like prostate. The finger does not reach the upper margin. The prostate bulges widely laterally and well posteriorly. The impression gained by the finger is an unusual one, the balloon-like mass seems so large and so uniform, it is only moderately tender, it is of moderate consistency, the abdomen is fat and rather rigid, the mass cannot be made out bimanually. The pulse is normal in frequency and in character, the heart sounds are clear, examination of the lungs is negative, the temperature is normal.

The patient was sent to a hospital and five days were spent in preparation for operation. During these days the urine was at all times abundant in quantity and normal in quality. While diagnosis was in doubt it seemed probable that the growth was malignant. The short duration of the symptoms, two months,

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<sup>\*</sup> Read before the American Surgical Association, May, 1907

the rapidity of growth the balloon like contour of the growth and the absence of residual urine pointed toward sarcoma and a tentative diagnosis was accordingly made cysto copy was not done The situation was fully explained to the patient who definitely requested operation

Operation under ether by the drop method at the Mercy Hospital February 12 1907 Ordinary inverted Y incision The central tendon of the perineum and the recto urethralis muscle were divided the deep urethra was opened and the finger passed readily to the prostatic urethra A gloved finger of the opposite hand in the rectum allowed bimanual palpation and showed the growth to be larger and to extend higher than was at first thought The finger tore readily through the prostatic urethra into the left side of the mass and the process of enucleation was begun This was attended by profuse alarming hemorrhage blood poured from the wound and the wound had to be firmly packed with hot salt cloths As soon as packing controlled the hemorrhage enucleation was proceeded with but was exceedingly difficult Very frequent hemorrhages obliged one to stop and pack Nowhere could a lead be gained between the gland and its capsule Friable masses were reamed out from both sides of the gland and from it posteriorly The cut surface had the appearance of sarcoma An assistant's fist above the pubes crowded the bladder down yet one could not reach the upper part of the growth this upper part seemed fixed As much as possible was brought down and torn away by heavy ringed clamps At all points the growth seemed fused with the prostatic capsule and it was apparent that here and there a portion was left behind A T shaped tube along side of which was sewn a small irrigation tube was placed in the bladder and the large prostatic cavity firmly tamped and packed with sterile gauze The loss of blood had been great and although salt infusions had been given on the table the patient was returned to his bed with a poor pulse

During the succeeding 24 hours the patient's condition was precarious but under copious salt infusions and ordinary stimulation he picked up and at the end of 36 hours was in fairly good condition and secreting a good amount of urine At the end of the second day a double pneumonia appeared to which he succumbed on the fifth day An autopsy was not permitted.

The masses of growth removed amounted to a double hand-full. They were handed to Dr J. A. Wilder, Professor of Pathology in the University of Denver, who makes the following report:

"The specimen consists of a number of large and small pieces of a reddish-gray, rather friable tissue. The pieces are irregular in shape, the larger ones are from two to five centimetres in diameter.

Histologic examination of sections from different parts shows the tissue to be composed chiefly of small round and oval cells with very little intercellular substance. A delicate fibrillar supporting meshwork in which the tumor cells lie can be made out in some areas. The nuclei of the cells are large and prominent and have a distinct nuclear membrane. A small ring of protoplasm can be seen around the nuclei of many of the cells, in others it cannot be seen. These cells have no definite arrangement. The vascular supply is fair. The bloodvessels have very thin walls and are surrounded by the tumor cells. The remains of the prostatic tissue are seen in some of the sections in the form of a stroma of unstriated muscle fibre and fibrous tissue containing gland-tubules lined with cuboidal epithelium, the glands in several instances containing corpora amylacea.

*"Diagnosis—Small round-celled sarcoma of the prostate"*

In the foregoing case operative attempt was dangerous. Complete operative removal was to me impossible. Immediate microscopic examination of the first fragment removed from the growth might have certified its nature and thus have saved an operative death. The growth was extending so rapidly, however, that death by sarcoma would have been speedy. I doubt if the supra-pubic route would have given better access to the tumor than did the perineal, I judge that the hemorrhage was controlled better through the perineum than it could have been through the bladder.

A careful study and analysis of accessible literature records but 22 additional cases<sup>1</sup> of microscopically proven, primary

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<sup>1</sup>In certain instances cases have been accepted by one writer and discarded by another. In the present communication the writer has endeavored to class as authentic only those cases microscopically proven and primary. For example, the case of Dupraz is here classed as probable only, as it possibly had a primary seat in the scapula. The cases accepted in this paper may be verified through the table of references. In order to identify them the writer appends the age of the patient and the form of the growth as follows:

sarcoma of the prostate These are reported by Barth Birsch Hirschfeld Burckhardt Botescu Gibson Gratzner Kaufmann Levy H Marsh Matthias Oliva Socin (2 cases) Schalek Spanton Stern Tordeus West Wharton Wind Van der Hoeven and Verhoogen Cases which are not definitely authenticated but which are probably true cases are reported by Adler Aiken Cabot Coupland Dupraz Harris Isambert Jolly MacGowan<sup>a</sup> and Mann while doubtful cases are instanced by Barth (2 added cases) Bree Dickinson Ferguson Jolly (Anat Specimen) Kapsammer Reboul Socin (added case) and Spanton

The ages of the patients in the 23 cases classed as authentic are as follows

	15 years	13
16	30	4
31	60	5
Over 60		1
		—
		3

The condition is therefore to be considered most frequent in childhood

Histologic examination of the specimens obtained from these 23 cases shows the form of the sarcoma to be

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Barth 17 years spindle and myxo sarcoma Birsch Hirschfeld 1 year adeno sarcoma Burckhardt 40 years spindle celled Botescu 1 year angio sarcoma Gibson 35 year small round celled Gratzner 15 year large round celled Kaufmann 1 years small round celled Levy 4 year myxo-sarcoma H Marsh 5 years spindle celled Matthias 70 years angio sarcoma Oliva 18 years small round celled Socin 8 months small round celled (also 51 years round celled) Schalek 3 yr mixed celled Spanton 5 years myxo sarcoma Stern 4 year small round celled Tordeus 8 months spindle celled Wharton 35 years small round celled Wind 1 years small round celled Verhoogen 23 years myxo sarcoma Van der Hoeven 64 years Sarcoma microscopic examination West 21 year mixed cell'd Author case

Case also reported by Hughes.

<sup>a</sup> A letter received from MacGowan since the paper was published the author to place the case in the accepted class

Small round celled	in	8 cases
Spindle celled	"	3 "
Myxo-sarcoma	"	3 "
Spindle celled and myxo-sarcoma	"	2 "
Small round celled and spindle celled	"	1 "
Angio-sarcoma	"	2 "
Adeno-sarcoma	"	1 "
"Mixed" celled	"	1 "
Large round celled	"	1 "
Mic examined but form not given		1 "

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 23 cases

The small round celled form is therefore the most frequent

As compared with carcinoma, sarcoma of the prostate is infrequent. Englebach gives as percentages carcinoma 86 per cent, sarcoma 14 per cent. This sarcoma percentage is undoubtedly very much too high. A reasonably accurate computation will not be made until reports are furnished on large clinics in which all prostatic growths are submitted to routine microscopic examination.

The diagnosis is at times easy, at times difficult. A rapidly growing tumor of the prostate in a child or youth is probably a sarcoma. So, as well, is a rapidly growing, soft, balloon-like prostatic tumor in an adult. Pain is generally marked and is referred to the pubes, perineum and rectum. Urinary urgency is not generally present in the early stages. As in the case which forms the subject of this paper an enormous growth may be unaccompanied by residual urine.

Prognosis in these cases is necessarily bad. In each of the authentic cases submitted to analysis by the writer either (a) the disease went on to a fatal termination or (b) the patient succumbed to operation or (c) to relapse after operation or (d) the case was reported simply as an operative recovery. An editorial writer in the *Am Jour of Urology* (1905-6, vol 2, p 129) goes so far as to say that the simplest and most rational treatment is to allow the disease to progress. While it is true that no lasting cure has thus far been reported it is but rational to assume that in the future early diagnosis and appropriate management, either by operation or by sero-

therapy or by both may give to this disease a more hopeful outlook

[Addendum—Nov 22nd 1907—Conforti and Favento (Sarcoma della prostata *Folia Urologica* Sept 1907) in an interesting communication relate a well authenticated case and present a table of added cases Their patient was a man of 45 years who died of cachexia 4 months after an operation for primary lymphosarcoma of the prostate Their table embraces 30 additional cases From this list I am able to take the following six true cases not presented in my own references

(1) Bland Sutton Com to the Clin Soc of London 9 April 1897—Pt 7 yrs of age spindle cell sarcoma

(2) Guyon Proust et Vian Le Sarcome de la Prostata *Ann Des mal des org gen urin* 1907 No 10 Pt 19 yrs of age small round cell sarcoma

(3) Kaufmann Vide Socin & Burckhardt Pt 24½ yrs of age lymphosarcoma

(4) Rose Zwei Fälle v Prim Sarc d Prostata Com Frei Verein der Chir d Berlin 1901 Pt 5 mos of age small round cell sarcoma

(5) Ibid Pt 2 yrs 9 mos of age small round cell sarcoma

(6) Stein Archiv f Klin Chir Vol 39 1889 Pt 25 yrs of age Sarcoma (Mic Exam d)

Including the case of Conforti and Favento 7 cases are to be added to the 23 presented in the body of this article The addition of MacGowan's case makes a total of 31 authentic cases C A P ]

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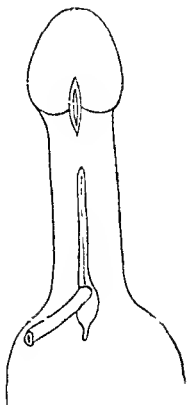
# A SYSTEMATIC OPERATION FOR PENILE HYPO- SPADIAS AND OTHER DEFECTS OF THE URETHRAL FLOOR

BY G FRANK LYDSTON, M D,  
OF CHICAGO

In the *New York Medical Journal* of April 29, 1905, in an article entitled "Contribution to the Plastic Surgery of the Urethra," I outlined a number of procedures for the restoration of the urethra in lesions of varying extent and severity. In this article I formulated principles of technique which, I think, must, when conscientiously followed, solve many of the problems of "urethra building." I have applied these same principles to the relief of penile hypospadias and have, I believe, thereby solved one of the most trying of surgical problems. I will state that, in my operation, the technique devised by my friend, Dr. Carl Beck, of New York, is exactly reversed. It has been my experience that in cases of penile hypospadias in which the deformity is marked, the urethra is contracted bow-string-wise, and that Beck's operation is likely in most cases to make a bad matter worse, especially so far as the sexual function is concerned. It will be noted that in the operation herewith presented the patient's condition cannot possibly be aggravated, the deficiencies of neither the sexual nor the urinary function being increased by the operation. In case of failure the tissues involved are not of sufficient importance, nor so scanty as to increase the deformity, neither will one or several failures prevent further operative efforts. The principles of the technique are the same as those described in my article already mentioned.

The preliminary operation for curvature, and urethral transplantation are, of course, unnecessary in cases of extensive destruction of the anterior urethra by traumatism or disease. Three highly successful cases of operation for penile hypospadias have proven to my own satisfaction the correctness of

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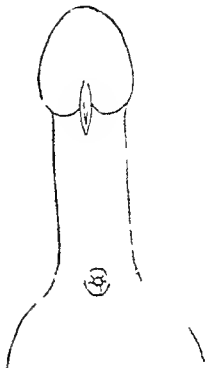


FIG 3

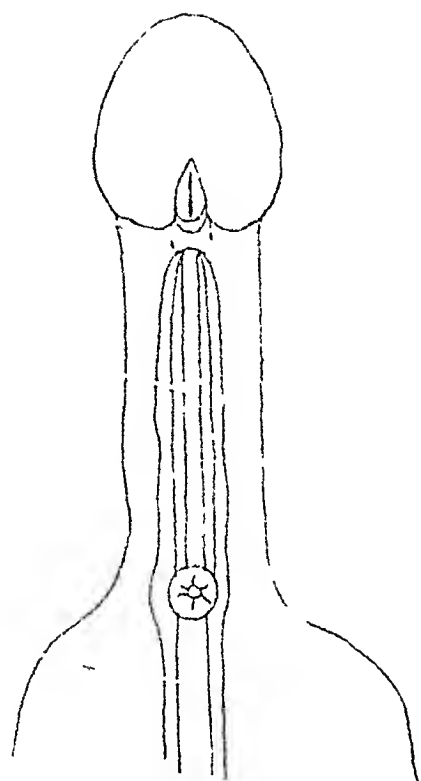
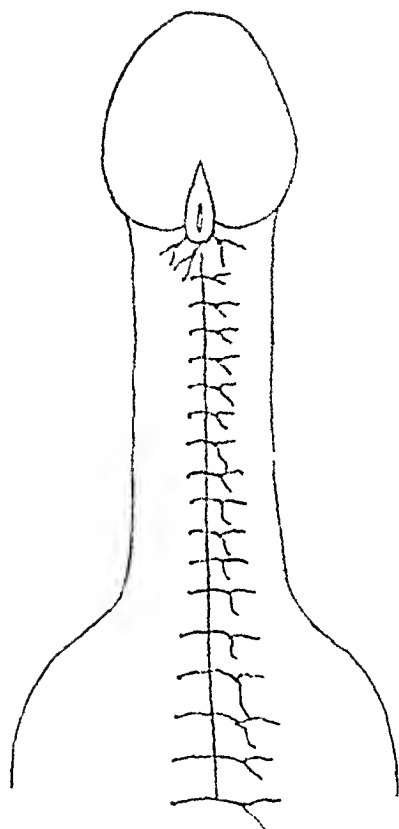


FIG 4



the technique and that it is the ideal method for such cases. The three cases were almost identical and the operative technique the same. I append in detail illustrations showing the various stages of the operation in my last case.

**CASE.** A youth of seventeen presented himself with penile hypospadias the meatus opening about an inch and a half posterior to the base of the glans. The penile curvature was so marked that the sexual function was destroyed. Micturition was normal but the patient complained of soiling of the clothing by the urine. The normal meatus was represented by a cleft (a Fig. 1) and the urethra anterior to the pseudo meatus was entirely absent.

**PRELIMINARY OPERATION.** The corpus spongiosum was dissected from the body of the organ and all constricting bands of fascia upon the under surface of the corpora cavernosa divided. The incision was begun anteriorly just in front of the pseudo meatus. The corpus spongiosum urethra having been dissected free as shown in Fig. 1b the muco-cutaneous border of the pseudo-meatus was trimmed away no further resection of the apparently redundant urethra being necessary. As soon as the organ was straightened a little tension on the perineal urethra with the thumb and fingers caused the freed urethra to sink well down within the perineo-crotal space. The margin of the anterior extremity of the freed urethra was now split above and below and the skin and mucous membrane sutured with fine catgut so as to insure permanency of the new meatus which was located just at the peno-scrotal angle (Fig. 2).

The incision on the under surface of the penis was now closed and the organ strapped up over the abdomen so as to hold it straight and immobile as near as might be.

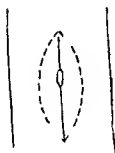
A second operation to restore the caliber of the meatus had to be made on account of the patient's negligence in failing to report for dilation. The patient was confined to bed for two weeks. Ninety days later the new meatus at the peno-scrotal angle having retained its patency and the cicatricial tissue about it and on the under surface of the penis in the line of the longitudinal incision made for the purpose of freeing the corpus spongiosum having become reduced to a minimum the final operation was performed.



A perineal puncture was first made and catheter drainage established. Two longitudinal incisions were made upon the under surface of the penis, beginning at a point about three-quarters of an inch posterior to the cleft approximately representing the normal site of the meatus. A strip of skin a little over  $\frac{1}{8}$  of an inch in width was left upon the under surface of the penis, this strip of skin being continuous with the mucosa of the roof of the urethra at the peno-scrotal angle (Fig 3a). This strip of skin was designed to form the roof of the new penile urethra (A very narrow strip of skin is sufficient. During repair the epithelium is reproduced to a sufficient extent to thoroughly cover in the roof of the new urethra). The skin was now dissected up laterally to the right and left on the under surface of the penis for a distance of about three-quarters of an inch. This was continued forward in such a way as to form a bridge anteriorly by tunneling to a point corresponding to the posterior commissure of the cleft already described (Fig 3b). This bridge of tissue was raised and the quasi-mucous membrane at the bottom of the cleft stitched to the anterior extremity of the strip of skin above described. This completed the roof of the new canal. A rectangular longitudinal flap was now outlined in the median line of the scrotum this flap being a little less than an inch in width (Fig 3c). A strip of epithelium, one-half inch wide, in the center of this flap was preserved and the outer borders of the outlined flap denuded of epithelium. The flap was now dissected free, its corners rounded slightly, and the flap brought forward and upward, its anterior extremity being stitched to the borders and sides of the space beneath the bridge of skin anteriorly (Dotted line, Fig 3). The edges of this flap were stitched upon either side with fine catgut to the fascia of the penis at the base of the lateral penile flaps. This completed the edges of the lateral flaps and the edges of the wound made in the formation of the scrotal flap were stitched together with horsehair. The completed operation is shown in Fig 4.

The progress of the case was uneventful. A very small area of sloughing was formed at the anterior extremity of the flap, so that the new meatus was perhaps one-quarter of an inch longer than it would have been had the sloughing not occurred. At the end of three weeks the patient was urinating normally through the new urethral canal, the deformity was completely

Fig 5





relieved and the conditions were as satisfactory as one could wish.

In my first two cases of the kind no loughing whatever occurred.

I wish to reiterate what I have in substance already stated, that in case of complete failure of an operation of this kind the patient is no worse off than before the operation. Failure could hardly be complete in any case and any portions of the flaps that retain their integrity will be so much gained. Subsequent operations can be readily made as the tissues from which the flaps were formed are abundant. In making the urethral floor the entire thickness of the scrotum should be employed and care should be taken not to score it. I believe that the tendency on the part of the surgeon would naturally be to thin down the edges or anterior extremity of the flap. I wish to warn against this as the essence of the operation is in the preservation of the vitality of the scrotal flap.

# SIMPLE FRACTURE OF THE CARPAL SCAPHOID

WITH A REPORT OF SEVEN CASES

BY WILLIAM A. DOWNES, M.D.,

OF NEW YORK,

Principal to Class in Surgery, Out Patient Department, New York Hospital, Surg. con to Out Patients, and Adjunct Assistant Surg. con, Bellevue Hospital, Instructor in Surgery, Cornell University Medical College

It is not intended that this paper shall treat exhaustively the subject of fracture of the carpal scaphoid, but its purpose is to call attention to the more important symptoms, the diagnosis and treatment of the uncomplicated injury in its recent state. The good result obtained in four of the seven cases herewith reported is unquestionably due to the fact that the diagnosis was made and the proper treatment instituted within a few hours after the fracture was received. While the force exerted at the time of the injury no doubt determines, in a large measure, the amount of displacement in the fragments, yet a failure to immobilize the wrist joint very early, might tend to change an otherwise favorable into an unfavorable case, for union with the fragments in good position is necessary in order to obtain the best results.

Of the seven cases upon which these observations are based, four were treated in the out-patient department of Bellevue Hospital and three in the out-patient department of the New York Hospital. All were treated since January the 26th, 1907. In seven years continuous out-patient service I had not before this recognized a single case of carpal fracture, no doubt treating more than one during all that time as a simple sprain. If, however, any cases were overlooked in the last five years it was due to the fact that they were not considered of sufficient importance to have them radiographed, for it has been the routine custom at the New York Hospital to X-ray and keep a record of the findings of all cases of suspected frac-

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\* Read before the New York Surgical Society, October 23, 1907

ture since 1902. The same custom is in vogue at Bellevue and the same criticism holds good.

The cases followed closely one upon the other a number being under observation at the same time. A positive diagnosis was made in four of the cases with little difficulty and in two the condition was strongly suspected. In the other case (No. VII) the patient had been treated for a Colles fracture for four weeks before coming under our care and the fractured scaphoid was accidentally discovered by the X-ray; the radius had not been fractured. The ages of the patients ranged from thirteen to forty six years and the injury was received in each case save one by falling on the extended hand. The single exception (Case I) fell from his truck and is sure that he struck on the back of the flexed wrist although there was no ecchymosis or sign of contusion. All of the patients were males. The left wrist was the seat of the injury five times and the right twice.

A remarkable feature of Case IV is the fact that the X-ray picture shows a fracture of both scaphoids. This patient received an injury to the left wrist by falling from a scaffold the day before admission but did not in any way injure the right; however he recalled upon being questioned having injured his right wrist some six or seven years before while attempting to move a heavy stone. The injury was treated as a sprain and nothing more was thought of it until he began to work as an electrician two years ago. At that time he found the right hand much weaker than the left and that he favored it in all efforts requiring rotation or extension. Case VI, aged thirteen, is so far as I can find out the youngest yet recorded. Case VII was not seen until four weeks after the injury; the others were treated in from one to twenty four hours after being hurt. In Cases III, V and VI as shown by the radiograph there was practically no displacement of the fragments and in only one case (No. IV) was the displacement marked.

The line of fracture was in the middle third in six cases and at the junction of the middle and proximal thirds in one.

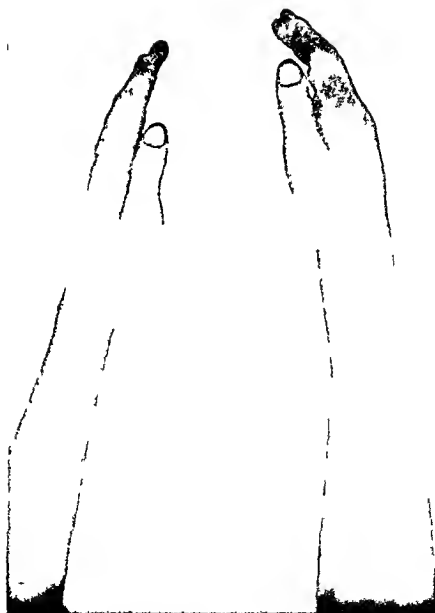
In so far as we could determine from examination of the patients and X-ray photographs none of the other carpal bones was fractured, nor was there dislocation of the semilunar bone.

The immediate symptoms of fracture of the carpal scaphoid are very similar to those of a sprained wrist, *viz*, there is a history of a fall on the extended hand (6 out of 7 cases) followed by pain, swelling and disability. In each of our cases one or all of these symptoms were so severe that the patient sought advice in less than twenty-four hours. The pain was intense immediately after the injury but in most of the cases had subsided so that the patients were fairly comfortable on admission. The hand was held rigid, and this undoubtedly accounted for the quiescence of the pain, motion in any direction however, caused it to recur, especially any effort at extension either active or passive. In fact, extension was limited in each instance to a few degrees, while flexion was permitted in from fifteen to thirty degrees.

The swelling followed the injury quickly and was more marked on the dorsal aspect and radial side of the wrist. In only one case (No I) was it extensive. A photograph of Case VI, taken twenty-four hours after the injury, shows the average amount of swelling and the absence of any apparent bony deformity. (Fig I)

The disability is about what would be expected when the nature of the injury is taken into consideration—loss of power to grasp an object or inability to perform any function requiring an effort at extension or rotation.

Upon examination it will be found that the swelling is mostly on the radial side of the wrist, that the ulnar and radial styloids are normal in their relations and that pressure over the middle of the scaphoid, with the hand slightly flexed and adducted, causes exquisite pain. This tender point with the pain upon efforts at extension are the two most characteristic symptoms. Ecchymosis was not present in any case—either immediate or late. Crepitus was obtained in two cases (Nos I and III), and it was due to this fact that the diagnosis in the first case was so readily made. This sign was elicited in Case



Photograph of Case VI (two types of [unclear])





I by my associates at Bellevue Drs Garrigan and Cramp as well as myself and was easily detected without undue pain and in spite of the unusual swelling which was present in this case I do not believe that it is necessary by any means to obtain crepitus in order to make the diagnosis nor do I think it wise to use force in trying to get it for any undue manipulation may displace one of the fragments thereby jeopardizing the chances of obtaining a good result

The diagnosis of simple fracture of the scaphoid should be made in the majority of cases without much difficulty The history of a fall on the extended hand the swelling along the radial side and dorsal surface of the wrist the localized point of tenderness below and to the dorsal side of the radial styloid and the extreme pain when any attempt is made to extend the wrist form a symptom complex which makes the recognition of this condition fairly certain If to the above we add crepitus little doubt remains Finally every case of injury around the wrist joint of sufficient severity to cause the patient to seek advice should be radiographed This should be done not only to verify the diagnosis but it is of great value in giving the prognosis as the amount of separation or displacement of the fragments govern the final result

I agree with the statement of Codman and Chase in their splendid article on this subject that it is not necessary to give ether in order to make the diagnosis but that we should depend upon the clinical symptoms and X ray findings Resort to anesthesia should be made only in those cases where some complication exists as dislocation of a fragment or the semi lunar bone or both and then for purposes of reduction

In cases of sprain the tenderness is not so marked the swelling is apt to be more evenly distributed and efforts at extension are not so painful

In fractures of the lower end of the radius the swelling extends much higher on the forearm the point of tenderness is above the level of the styloid processes and usually there is the characteristic deformity of Colles fracture Occasionally however we see fractures of the lower end of the radius with

out deformity, and here the point of tenderness is of most diagnostic value

The suggestion of Codman and Chase that both hands be radiographed on the same plate has been adopted and has proven of great assistance in that it has helped to properly interpret the plates. The uninjured carpus acts as a guide, as by it we can get a better idea of the location of the fracture, the amount of displacement in the fragments, etc., furthermore, the question of a bipartite bone is settled. In six of the cases the uninjured scaphoid corresponds in every particular with the normal. The seventh is the case in which there had been an injury to the other hand six or seven years before. That both scaphoids have been fractured in this case there can be no doubt, as the radiograph shows plainly the line of fracture and the displaced proximal fragment in the recently injured side, and in the old injury it shows that the distal fragment has apparently turned and is lying at a right angle to the normal axis of the bone. The radiographs should be taken in two planes, anteroposterior and lateral and several should be made in order to avoid mistakes. If the patient can adduct the hand (ulnar flexion) without too much pain, it is better to have the anterior exposure made with the hand in this position as it gives a much clearer view of the scaphoid.

The treatment for simple fracture of the carpal scaphoid in the recent state, with the exception of those cases in which there is considerable displacement or dislocation of a fragment, should be immobilization with the hand straight. Fixation is best accomplished by means of moulded plaster splints extending to the bases of the fingers. A small pad of gauze was placed over the dorsal aspect of the bone, and held in position by adhesive plaster, in each of our cases before the splints were applied, it seemed to exert pressure just where the swelling was most marked and probably helped hold the fragments firm. Fixation should be employed in every case as soon as the clinical diagnosis is made, if the radiograph does not confirm the diagnosis no harm is done but if on the other hand the fracture is found, much good will have been accomplished.

The fingers should be moved freely from the outset. Once a week the splints should be readjusted and at the end of the third week they should be removed for fifteen minutes daily and the wrist gently massaged. After the fourth week the splints are discarded and a snug bandage is worn as a support from two to three weeks. At the end of this time the hand will be fairly strong but the tenderness in the region of the anatomical snuff box and the pain on forced extension will persist for some weeks longer.

In the cases where there is marked displacement or dislocation of a fragment and correction cannot be made under anaesthesia one or both fragments should be removed without delay. If the displacement is not too great an attempt to adjust the fragments by varying the position of the hand and noting the result with the fluoroscope would be worth trying before proceeding radically.

The final result will depend upon the position of the fragments, the presence or absence of complications and upon the length of time that elapses after the injury is received until the wrist joint is immobilized. In three of the cases (III, V and VI) there was very little separation and no displacement of the fragments and in each the result has been practically perfect. In one (Case II) the separation was greater and the line of fracture more uneven than in the above and while the result can be classed as very good yet there is limitation of extension to about one-half normal. In every other respect the outcome in this case is the same as in Cases III, V and VI. In the fifth and final case which I have been able to trace (No IV) the result is by no means so satisfactory. The radiograph of this case taken twenty-four hours after the injury showed considerable inward displacement of the proximal fragment and it is evident from a recent examination and radiograph (five months after the injury) that union has occurred with faulty position.

As I look back on this case it would no doubt have been wiser to have removed the proximal fragment at the outset. Such a course has been advised if improvement does not take

place in the next two months. If union is very firm, the entire bone may have to be sacrificed.

### CONCLUSIONS

1 Simple fracture of the carpal scaphoid is caused as a rule by a fall of moderate height (3 to 7 ft in this series) on the extended hand.

2 This form of fracture is more apt to be overlooked than the complicated type on account of the absence of deformity and the resemblance it bears to a sprained wrist.

3 Exquisite tenderness on pressure with the wrist slightly flexed and adducted, just below and to the dorsal side of the radial styloid, with extreme pain on any effort at extension, are the two most characteristic symptoms.

4 Union will take place provided the fractured surfaces are in contact and the wrist is immobilized for from three to four weeks.

5 The final result, under proper treatment, will depend upon the amount of separation or displacement of the fragments. In cases where the position of the fragments is good the result should be practically perfect.

6 If there is dislocation or considerable displacement of a fragment which cannot be corrected, one or both fragments should be removed without delay.

For the radiographs of the cases I am indebted to my friends Drs A H Busby and J H Kenyon.

### CLINICAL RECORDS

CASE I—D W, male, aged forty-one years, driver. Admitted to O P D Bellevue Hospital January 26, 1907, with a history of having fallen from the seat of his wagon the day before. He says that his hand turned under him and that the force of the fall came on the back of the wrist. Pain and disability immediate, swelling gradual. Upon examination eighteen hours after the injury the swelling was very marked, extending for a considerable distance up the arm, and was double the amount present in any of the cases that followed. No ecchymosis. Flexion to 20 degrees. Extension, abduction and adduction

caused intense pain and were limited to a few degrees. Marked tenderness in the scaphoid region. Crepitus obtained without undue force. Diagnosis of fracture of the scaphoid made and confirmed by the X ray. The radiograph showed the fracture to be in the outer portion of the middle third of the bone and the fragments to be in fairly good position. Moulded plaster splints extending to the bases of the fingers with a pad over the scaphoid. Splints readjusted at the end of the first and second weeks. Massage for fifteen minutes every other day after third week. Plaster left off at end of the fourth week. This case was examined on March 9th six weeks after the injury and the fragments seemed to be united. There was moderate tenderness over the scaphoid and extension was painful but there was fair motion in all directions. The patient had returned to his work as a driver and was pleased with the result. Repeated efforts to find this man for a final examination and X ray have failed.

CASE II.—F. H. male aged twenty seven years driver. Admitted to O P D Bellevue February 28 1907. About two hours before coming to the hospital he had slipped from the ice covered foot board of his wagon falling on the extended left hand. There was immediate pain and disability followed by swelling. Examination showed moderate swelling in the scaphoid region. Pressure in the anatomical snuff box elicited the characteristic point of tenderness. All efforts at motion caused extreme pain. Ecchymosis and crepitus absent. In view of the history and having in mind the preceding case the diagnosis of simple scaphoid fracture was made and confirmed by the X ray. The fracture was just distal to the middle of the bone and there was moderate separation of the fragments. The treatment was carried out as in the first case except that the splints were left off about the middle of the fourth week. This man returned to work in six weeks though there was still some swelling and tenderness and limitation of all motion to about one half normal. Examination September 11th six months after the injury shows normal flexion adduction and abduction but extension is limited to half the normal. There is no tenderness on pressure over the scaphoid nor is there pain or muscular spasm when the hand is forcibly extended. Extension seems to be limited by the slight thickening in the region of the scaphoid. There is just the least fullness below the tip of the radial styloid other

wise the appearance of the two hands is the same. Radiograph taken September 1, 1907, shows the bone to be shorter than the opposite one, due to slight overlapping of the fragments, union, however, has taken place. This man is working every day, has no pain or discomfort and says he considers his left hand as well and strong as the right.

CASE III.—J. McK, male, aged twenty-six years, driver. Admitted to the accident ward of the New York Hospital March 14, 1907, with a history of having fallen a short time before upon his extended left hand. He was pulling on a rope when it broke and he fell from his wagon to the street, a distance of about five feet. Was treated by Dr. Truetsdell of the House Staff who made a probable diagnosis of fractured scaphoid and applied moulded splints. The case was referred to the O P D on the following morning. Upon examination the swelling was slight, due, no doubt, to early fixation of the joint. The pain on any attempt at motion and the tenderness over the scaphoid were present. No ecchymosis. Crepitus was obtained in this case, the second and last one of the series in which it was present. X-ray verified the diagnosis. The fracture was at the middle of the bone and there was practically no displacement of the fragments. Treatment as outlined except that this patient did not return after the third week, consequently had no massage. He removed the plaster himself and went to work on the twenty-eighth day. I examined him and had an X-ray taken on September 1, 1907. It was with difficulty that I could tell which hand had been injured, so good has been the result. The range of motion is normal and there is no tenderness over the scaphoid or pain on hyper-extension. There is no fullness in the region of the anatomical snuff box. The recent radiograph shows distinctly the line of fracture. Union is complete with the fragments in perfect position. This patient is following his occupation as a driver and uses the left hand every bit as well as before he was injured.

CASE IV.—A. R, male, aged twenty-one years, electrician. Admitted to the O P D New York Hospital March 27, 1907. On the afternoon before he had fallen from a scaffold seven feet high, receiving the weight of the fall on the palm of his left hand. There were the usual symptoms which go with a severe injury to the wrist and the physician who saw him immediately after the

accident treated the case as a fracture of the lower end of the radius. Upon examination at the dispensary we found the swelling moderate and confined almost entirely to the dorsal surface of the radial half of the joint. The slightest motion caused exquisite pain in fact this patient complained more bitterly of the pain than any of the others consequently it was difficult to make a very complete examination. The tenderness was not localized as in the other cases but involved the radial half of the carpus. Injury to the radius was ruled out and a diagnosis of fractured scaphoid with probable injury to some other carpal bone made. The radiograph showed only a transverse fracture of the scaphoid at the junction of the middle and proximal thirds with median displacement of the proximal fragment. Moulded splints with gauze pad applied in the usual way and massage given after the third week. The symptoms at the end of six weeks had not improved as in the other cases the swelling had disappeared only partially the pain on extension beyond five or ten degrees and on flexion more than twenty degrees was severe and there was marked tenderness over the inner half of the scaphoid. For one reason or another I did not see him for three months after this in the meantime he had resumed his work but the pain and partial disability were such that he could not do satisfactory work and he again consulted me. The condition had improved considerably since I last saw him however the fullness over the scaphoid the limitation of motion to about half the normal and some tenderness were still present. Examination September 18th showed very little change. According to the radiograph taken August 28th there is union but the position of the fragments is bad. This is the case in which the opposite scaphoid (right) had been fractured some years before the discovery of which was accidentally made by taking a radiograph of the two hands. Examination of the right hand shows that extension cannot be carried beyond a straight line all other motions however are normal. There is a slight atrophy in the region of the anatomical snuff box and with the hand completely flexed there is a distinct depression at this point. According to my interpretation of the X ray the distal fragment has rotated and a false articulation has resulted.

CASE V—A E male aged twenty nine years carpenter. Admitted to the O P D New York Hospital April 10th twelve



hours after falling from a moving street car. As he fell he put out his left hand to save himself and the force of the fall came on the palm. The pain and discomfort were only moderate and not until the following morning did he seek treatment. On examination the swelling was of the average amount and in the usual situation. Flexion, abduction and adduction were permitted to a greater extent than in any of the other cases. Intense pain, however, was caused by pressure in the anatomical snuff box and on the strength of this with the limitation of extension a probable diagnosis of fracture of the scaphoid was made. The X-ray taken on the following day showed an irregular line of fracture, the outer portion situated just at the tubercle, is roughened, while the inner half is smooth. Same treatment applied as in the other cases. Patient discharged at the end of fifth week. All symptoms, except pain on forced extension and moderate tenderness in the snuff box, had disappeared. Examination and X-ray September 13th show the wrist to be practically normal. In the radiograph the inner half of the line fracture can be made out. Union is complete. This man works at his trade every day and says there is no difference in the two hands.

CASE VI—W. C., male, aged thirteen years, office boy. Admitted to the O. P. D. Bellevue Hospital April 25, 1907, with the history of having fallen from a ladder upon the extended right hand one hour before. Distance of fall about five feet. The pain was intense and it was for the relief of this symptom that the boy sought treatment. Swelling moderate and about the same as is shown in the photograph taken twenty-four hours after the injury (Fig. 1). On account of the pain the wrist was handled very little. Motion was very slight and the disability complete. Fracture of the scaphoid was considered the most likely diagnosis, but on account of the boy's age no one would venture a positive opinion. The radiograph (Fig. 3) showed a fracture running obliquely in the outer portion of the middle third of the bone. The wrist was immobilized and treated as outlined above. Splints removed after the third week. I examined this boy August 19th, four months after the injury and the wrist seemed normal in every particular. No pain, no tenderness and no limitation of motion. X-ray taken at this time gives the bone the appearance of being a little denser along the line of fracture than the normal. Union perfect.

**R/GHT**

NO 2337

1. The first part of the paper is devoted to the study of the properties of the function  $f(x)$  defined by the equation



**RIGHT**



CASE VI — Picture right scaphoid Radiograph at time of injury

CASE VII.—J F male aged forty six years hostler Admitted to Out Patient Department Bellevue April 25 1907 Four weeks before he had slipped upon the sidewalk and fallen on the extended left hand He was treated for a Colles fracture in one of the larger hospitals of this city but was not satisfied with the result. The wrist was swollen and had the appearance of a case of sub-acute arthritis Motion was limited to a few degrees of flexion There was tenderness over the entire carpus due no doubt to the force which had been used the day before in an attempt to break up adhesions The fingers were held in extension and could be only slightly flexed Disability complete No diagnosis was made but the radiograph showed a transverse fracture at the middle of the scaphoid with displacement of a small fragment to the outer side Mas age and Bier's hyperæmia were begun on this patient and carried out for three days when his visits to the dispensary ceased We have since been unable to locate him

[Since writing this paper three additional cases of simple fracture in the recent state have come under my observation]

# OBSERVATIONS ON THE TREATMENT OF FRACTURE OF THE NECK OF THE FEMUR IN 112 CASES

BY JOHN B WALKER, M D,

OF NEW YORK,

Surgeon Bellevue Hospital, Lecturer on Surgery, Columbia University

Since January 1st, 1906, there have been admitted to Bellevue Hospital, 378 cases of Fracture of the Femur, and of these, 112 were cases of Fracture of the Neck

SEX 53 cases occurred in males and 59 cases in females  
49 involved the right Femur and 58 the left Femur

AGE 9 cases occurred in patients under 30 years of age,

21	"	"	"	between 30 and 50	"
22	"	"	"	50	" 60 "
42	"	"	"	" 60	" 70 "
15	"	"	"	over 70	"

In 3 cases the age was not given

Formerly it was regarded as a fracture occurring almost exclusively in old age Kocher stated that he had observed it rarely before the age of 50 Our statistics show a large number occurring below the age of 50 This is probably due to the fact that all accident cases are now more frequently brought to hospitals for examination The fact that its frequency increases with age is due to the senile changes of old age—senile osteo-porosis, which is caused by the diseases of the vascular walls The cortex becomes thinner, many of the lamellæ of the spongiosa are absorbed, and are replaced by large cavities filled with yellow marrow All the conditions, which formerly gave the neck its power and resistance are lost and more especially in women than in men, so this fracture occurs more frequently in women than in men, as above 59 cases in females and 53 cases in males

CAUSE In 51 cases the cause was due to slipping and fall-

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\* Read before the New York Surgical Society, October 9, 1907

ing upon the floor or sidewalk frequently due to a misstep. These cases were generally more than 60 years of age. In 28 cases it was due to falling from a ladder scaffold or down stairs requiring more force than in the first group.

In 18 cases it was due to a fall from some greater height as from a loft down an elevator or from a fire escape etc. These cases were all under 50 years of age.

Thus the most frequent cause was mild in character and involved chiefly the old while in the younger individuals greater violence was the rule. In many cases it stated that the patient fell directly upon the hip and that a contusion was found on this area, so that here direct violence was the cause. In several others that as he stumbled he tried to straighten up to prevent falling he suffered severe pain in the hip and fell. The explanation of this indirect cause is that the hyperextension of the hip joint tightens the ilio-femoral ligament and the latter by reason of its greater strength tears the neck away from its base the trochanter.

**SYMPTOMS** Pain was present in every case and was always increased when motion was made.

Loss of function was noted in 94 cases in but few cases could the heel be partly drawn upward toward the hip.

**ANATOMY** In consulting the records of the above cases which were dictated at various times by different surgeons a considerable variation of nomenclature was found. Some adhered to the old terms of intracapsular and extracapsular others included both varieties of fractures under the single term of Fracture of Neck others used Kocher's classification of fracture subcapitalis and fractura intertrochanterica.

The terms intracapsular and extracapsular are unscientific inaccurate and misleading because the majority of cases do not fall distinctly into either group for they are mixed. Intracapsular cases were supposed to include all fractures in which lines were entirely within the capsule extracapsular all those which were entirely without the capsule but as the majority of fracture lines are oblique or diagonal and not strictly transverse a fracture might be intracapsular in front and extra

capsular behind, for the capsule is so arranged that it includes more of the joint in front and below than above and behind

Kocher's terms while more strictly anatomical did not gain popular usage

Stimson's classification has been followed, *i e*, fracture through the neck or subcapital, and fractures at the base of the neck. The neck is apt to break in one of two places, at its junction with the head, or at the base, its attachment to the trochanter

Formerly it was considered of more importance to differentiate closely between these two fractures as if the fracture were intracapsular the prognosis would be far more unfavorable than if the fracture should be extracapsular, consequently less would be expected and the treatment might be less efficient

Outward rotation was noted in 80 cases. If a line be drawn through the axis of the limb passing through the anterior superior spine and the tip of the great toe, the part of the limb lying to the outer side of this axis will be much heavier than the inner part. If now the normal support of the limb, the femoral neck be broken, the limb will naturally rotate outward by its own weight. When impaction occurs it will also be rotated outward, for the impaction takes place usually at the posterior portion of the neck and the trochanter is twisted backward

Shortening was recorded in 70 cases

In 3 cases  $\frac{1}{4}$  inch existed

10 "  $\frac{1}{2}$  " "

22 "  $\frac{3}{4}$  " "

20 " 1 " "

15 "  $1\frac{1}{4}$ -2 "

Shortening is the most important symptom and depends upon the lessening of the angle between the neck and the shaft, which approaches more to a right angle, upon impaction of the fragments or their displacement longitudinally. After the fracture occurs the strong muscles which are inserted about the trochanter contract and draw the trochanter upward, inward and

backward toward the crest of the ilium until checked by the resistance of the untorn portion of the capsule or by the abutment of the lesser trochanter against the inner fragment.

If impaction occurs the lower portion of the neck may be forced into the spongiosa of the head under these conditions shortening is not more than one inch. If the impaction is separated and the capsule yields the shortening may become increased to several inches. This was observed in several cases where movements had been made and the weight of the body had been borne upon the fracture.

Exact measurement is frequently difficult because it is so hard to keep both legs at the same angle with the pelvis they should be parallel or equally abducted from the median line. The measurement should be taken from the anterior superior spine to the most prominent point on the internal malleolus.

Bryant's method was frequently used. It consists in dropping a perpendicular from the anterior superior spine and measuring the distance from this line to the top of the trochanter and then comparing this with the other side.

A number of records merely stated that the trochanter was above Newton's line—a line drawn from the anterior superior spine to the tuberosities of the ischium.

Crepitus was recorded in 40 cases and was elicited when gently rotating the leg with slight flexion.

False motion was occasionally mentioned.

Impaction was seldom recorded—in but six cases when one considers the histories of the class of cases who enter Bellevue the period of delay which frequently exists it is not surprising that impaction seldom persists. That it was present at some time to some degree can be recognized from the X ray plates. These were made in 36 cases. In 29 cases the fracture was at the base and impaction existed in 18 cases in 6 cases the fracture was through the neck and impaction existed in one case.

**FULNESS IN SCARPA'S TRIANGLE** Under normal conditions the finger tips can be pressed deeply into the outer portion of Scarpa's triangle but in those cases in which there



has occurred a fracture of the neck a marked bony resistance is perceived on pressure This is due to the fact that in the most common variety of fracture the head and neck are bent backward and downward, thus resulting in forcing the apex of the fractured angle upward and forward into the region beneath Scarpa's triangle In a number of cases this has been a well marked symptom, but in a few cases has it been recorded

As indicating the necessity for a more thorough early examination with the additional help of an X-ray plate, it may be remarked that there were 15 cases of fracture, which had been treated from 5 to 10 days before entering Bellevue, as bruises, sprains and rheumatism Later careful examination demonstrated a fracture in each case

**MORTALITY** 10 patients died in Bellevue within the first week after admission,—5 of cardiac disease and 5 of pulmonary disease The youngest who died in Bellevue was 58 years of age, and only two died under 60 years of age Both were females Seven patients, who were transferred to the island, died,—4 within two weeks, 3 within 6 weeks Of these 18 who died within six months after the injury, 2 were between 50 and 60 years of age, 10 were between 60 and 70, 6 were over 70

**RESULTS** Of the 112 cases, 18 died, 32 have not been found (through moving from place to place), 30 are unable to work because of persistent impairment of function through pain, through restriction of movement at the hip on account of shortening and adduction, through the necessity of dependence upon crutches Twenty-two show improvement Twelve have abandoned their crutches and are walking comfortably with a cane, but at times with some stiffness and occasional pain They are beginning to do some work Ten have recovered almost completely, they are free from pain and stiffness, and are able to do their normal work Ten are still in the hospital

In searching through the histories and records of these cases it was interesting to learn that 34 cases or 30 per cent had been brought to Bellevue from other hospitals after re-

remaining in said hospital for less than one week. Furthermore of all the cases admitted to Bellevue 54 cases or 50 per cent were retransferred or discharged from Bellevue within fifteen days.

Considering that so many cases were recorded so brief and probably so unsatisfactory a treatment before being discharged or passed on to some other hospital one might feel that there was some slight indifference to the future welfare of a patient suffering from fracture of the neck of the femur. One acute observer has written that it may well be that treatment is perfunctory because the prognosis is bad and the prognosis is bad because the treatment is ineffective. There exists the general belief that definite treatment toward securing restoration of form and function is hazardous and of little avail. Authorities have stated that our prognosis in cases of fracture of the neck must always be unfavorable and also if he escapes with his life he has to be contented with loss of function loss of symmetry and equipoise and he is often obliged to go about permanently crippled.

Scudder gives the following Results after Fracture of the Hip. Of especial value in this connection are the conditions existing in sixteen cases of fracture of the hip many years after the accident. These sixteen cases were treated at the Massachusetts General Hospital by traction and immobilization for periods varying from a few weeks to a few months. The patients then went about with crutches. No other treatment was used. Nearly all the cases were unimpacted either primarily or secondarily. At the time of the accident seven cases were between forty two and forty seven years old the remainder—with two exceptions whose ages are not stated—were over fifty three were over sixty years old. These cases reported for examination from two and one half to twenty four and one half years after the accident. Thirteen of the sixteen cases have impairment of the functional usefulness of the leg a weakness of the limb necessitating a crutch in many instances all movements at the hip somewhat restricted atrophy of the muscles of the thigh buttock and calf of the leg.

a decided limp, requiring a cane, pain in the hip extending down the thigh even to the sole of the foot, pain at night in the hip, pain in going upstairs and in stooping over. In only two cases out of the sixteen could it be said that the leg was functionally useful."

These results are most unsatisfactory, and combined with the above similarly unfavorable results in Bellevue they explain somewhat the generally pessimistic views of the profession at large. In his latest volume an eminent authority writes,—  
"The attainment of the ideal object of treatment—restoration of form and function is rarely to be expected or *even sought*"

These unfavorable clinical results together with the opinions of the authorities quoted emphasize the words of Bardenheuer at the last German Surgical Congress when he stated the suitable treatment of fracture of the neck was the most difficult in the entire realm of fractures and also the one most unsatisfactorily treated.

Bardenheuer and Maxwell both have demonstrated that it was possible under their methods of combined lateral and longitudinal traction, to obtain better results than under the usual methods with side splint and longitudinal traction.

Appreciating the impossibility of obtaining success with the old time method and being unable to employ in Bellevue the apparatus of Bardenheuer I have used the method advocated by Whitman in 16 cases during the past 18 months.

Of these cases 5 were males and 11 were females. 9 cases were under 50 years of age, 3 were between 50 and 60, 4 were over 60. One was through the neck and not impacted, 12 were at the base, 7 were impacted. In 13 X-rays plates were made to corroborate the diagnosis.

**METHOD** The following procedure was employed in the above cases. A careful examination was made of the patient's condition in order to determine the wisdom of giving an anæsthetic for a period of 20 minutes, this time being required for the application of the plaster bandage.

As soon as the anæsthetic permitted complete relaxation a gentle examination was made of the fracture, frequently

crepitus was found in those patients in whom impaction was thought to be present

The patient was then lifted up from the table and placed upon a box or pillows about 8 inches high and large enough to support the head shoulders and trunk. The pelvis rested upon a sacral support and the extended legs were held by assistants one assistant holding each leg. Another assistant stood at the head to hold the patient by the shoulders and trunk when later extension became needed. The leg on the fractured side was then *gradually* abducted to the normal limit of about 45 degrees the hip joint being held and supported by the hands of the operator. At the same time traction was being made to overcome the shortening by drawing down the leg as far as possible toward its original length as shown by previous measurements. The pelvis was prevented from tilting upward by simultaneously abducting the sound leg to 45 degrees it thus serving to indicate approximately the angle at which the fractured leg should be fixed. Outward rotation is corrected at the same time by lifting up and supporting the upper end of the femur and rotating inward the leg.

The plaster spica was so applied as to include the pelvis and crossed below the edge of the ribs this later permitted the patients to move about semi reclining and to rise in bed without so much discomfort as when the bandage was carried up to the chest line. It was fitted closely about the pelvis particularly about the trochanter and behind the articulation so as to give unyielding support to the fracture. Further the bandage was closely moulded about the patella and condyles of the femur and included the foot thus preventing completely any outward rotation.

In order to render the plaster bandages as comfortable as possible folded cotton batting or sheet wadding was placed over all bony prominences and over this a flannel bandage carefully adjusted free from wrinkles or creases avoiding all direct pressure over bony prominences. The plaster edges were trimmed and rounded so as not to come into contact with the skin.

**DIFFICULTIES** It is difficult to apply the plaster bandage because it is necessary to have experienced assistants with sufficient strength to overcome the contractions of the strongly elastic muscles during the entire period required to apply the bandage, and it requires unusual steadiness and concentration of attention of the operator, and *each* of the three assistants to maintain the exact relation of the fragments, for unless the bandage be applied exactly it will be either inefficient to correct the displacement or uncomfortable for the patient.

In hospitals where there are many such fractures it would be advisable to have a table similar to that employed by Schede, upon which the patient can be satisfactorily held.

It was hard to make the proper abduction and at the same time to prevent shortening. It is very important to make abduction complete for as it exercises direct traction upon the capsule so it renders the capsule tense in front and below. As it supports the sides of the fragments it tends to force them into alignment, so it assists in correcting the malposition of the inner fragment and brings the two into contact.

In impacted fractures, passive abduction affords the most practical method of reducing the deformity without danger of widely separating the fragments.

In many of the unimproved patients it was found that their inability to walk without discomfort was due to a restriction of adduction. Adduction was marked and added an apparent to an actual shortening of the limb. It is very important to overcome the shortening which is almost always present in the majority of patients for this shortening is responsible for most of their later disability.

**ADVANTAGES** It maintains complete immobilization during the period of repair, overcoming the shortening and adduction. The abduction prolonged during four weeks is of marked importance in aiding the future ability to walk without impairment or limitation of motion. It further relieves the patient from much unnecessary suffering on movement and renders him far more comfortable.

**TREATMENT** The aim of the treatment should be the

restoration of the normal function of the hip joint and in order to accomplish this result the normal anatomical form must first be restored. The same principles which are necessary to produce success in the treatment of fractures in other situations must also be employed here. In another group of cases which is fortunately small the age and weakness of the patient are so marked that only such expectant or palliative treatment should be considered. It is not difficult for the surgeon to decide upon the conservative method in these cases. It is desired to suggest the plaster bandage method for the larger number of younger and more robust patients for whom our results would indicate it to be desirable and applicable.

As the chief point to be sought for is to endeavor to obtain the complete or approximate restitution of the normal anatomical figuration of the bone so it becomes necessary to overcome the displacements of the fragments. As we have no power at all over the proximal fragment so we must endeavor to bring the peripheral fragment the peripheral portion of the femoral neck into the prolonged axis of the central fragment. The upper end of the distal fragment the trochanter major is drawn upward by the action of the gluteals and rectus femoris in front by the biceps semitendinosus and semimembranosus behind it thus becomes deviated upward inward and backward (producing the shortening the outward rotation is due to the mechanical weight of the leg a result of gravity) hence it must be conducted forward downward and outward. To accomplish this two forces are necessary longitudinal and lateral traction. These have been used by Maxwell and Bardenheuer and especially developed by Bardenheuer.

As has been shown the larger number of fractures occur at the base and in most of these cases impaction is also present immediately after the injury. In many cases however this impaction is broken up and the fragments are separated when brought to the hospital—especially Bellevue. In these unimpacted cases there has been no difference of opinion regarding the attempt to replace the fragments in their normal anatomical position. But in those cases in which impaction remains

there is a decided variance of opinion. It seems best after observing the good results obtained by Bardenheuer, Ochsner, Maxwell, Whitman and others to recommend that the deformity be reduced (while the patient is under the anæsthetic) by carefully separating, and unlocking, the fragments, not by tearing them asunder violently and harshly, but by carefully opening them as one would open a hinge.

Treatment should begin at once after the injury before the muscles have time to contract, and so displace the fragments. Each day's delay renders the reposition and reduction of the deformity so much the more difficult, and also permits the fragments to rub against each other, causing an increasing irritation which results in the production of an hypertrophic callus. Exact early reposition of the fragments decreases the amount of callus, and is indispensable for union in unimpacted fractures.

"At the present day our endeavor is not the production of so much callus, but rather as little callus as possible. When the fractured surfaces are in exact contact with each other along the entire extent nature does not need to supply much callus. Severe swelling about the fracture is always the expression of malposition of the fragments."

In Germany various surgeons, who have employed the extension method of Bardenheuer with such excellent results, recommend it so highly that it should be used here when circumstances permit. It will require experienced assistants who must be interested in its successful outcome.

RESULTS—CASE I—Male 45, moderately stout, alcoholic. Four days before admission he fell upon the left hip and was unable to move. He was brought to Bellevue, where a diagnosis of fracture at the base was made. There was  $\frac{3}{4}$  inch shortening and outward rotation existed. He was given an anæsthetic, when crepitus was easily found. A plaster bandage was applied including the foot. At the end of four weeks he was allowed out of bed on crutches. At the end of six weeks the plaster bandage was removed below the knee. At the end of eight weeks the entire bandage was removed and he went about on crutches, without any

pain. At the end of three months he was doing well still using crutches. At the end of four months he had abandoned crutches and was using only a cane. At the end of nine months he was at work. At the end of twelve months he had but  $\frac{1}{4}$  inch shortening and was able to do his regular work as a mechanic. Sixteen months after the accident he is without pain or discomfort and has but  $\frac{1}{4}$  inch shortening. flexion and abduction are practically normal.

CASE 2—Male 65 large frame well nourished. Four days before admission he slipped and fell upon the sidewalk striking his right hip. He was unable to move and was treated for a bruise for three days. He was transferred to Bellevue where a diagnosis of fracture at the base was made. there existed marked outward rotation and  $1\frac{1}{4}$  inches shortening. Crepitus was felt and fullness in Scarpa's triangle. Under an anæsthetic a plaster bandage was applied. He was confined to bed for four weeks then allowed to use crutches daily. At the end of eight weeks the entire bandage was removed but he was not permitted to bear any weight upon the injured hip until the fourth month. At the end of six months he used a cane only at times and was able to do work as a janitor. At the end of nine months he was in good condition. he could walk well without pain go up and down stairs and there was less than half an inch shortening. flexion and abduction are normal.

CASE 3—Female 47 large and fleshy. Two days before admission slipped and fell upon the sidewalk striking upon the right hip. She was unable to move and could not stand when lifted up. On entering Bellevue a diagnosis of fracture at the base was made. There were present outward rotation fullness in Scarpa's triangle crepitus and  $\frac{1}{2}$  inch shortening. Under an anæsthetic a plaster bandage was applied. At the end of five weeks the bandage was removed below the knee. At the end of eight weeks it was entirely removed and she was about on crutches. During the sixth month she used only a cane. At the ninth month she was able to do her normal housework without discomfort. She has no perceptible shortening. flexion and abduction are normal.

CASE 4—Male 17. Two days before admission he fell down an elevator shaft a distance of about five stories. He was unconscious but recovered within the next twenty four hours. There was found to be a fracture at the base. Outward rotation and



1¼ inches shortening were present Under an anæsthetic a plaster bandage was applied At the end of three weeks the bandage was removed below the knee At the end of four weeks he was out of bed using crutches At the end of eight weeks he was using a cane At the end of four months he was working on a farm At the end of six months he was doing his regular work as a mechanic At the end of one year there is but ¼ inch shortening, he walks with only a very slight limp, abduction and flexion are normal, and at no time has he any pain or discomfort

The favorable results exhibited by these four patients at the end of six, nine and twelve months, the absence of deformity, pain and discomfort, the freedom of motion and their ability to resume their regular work, are undoubtedly due to the method of treatment employed

Five other patients who have been under treatment for less than four months are up and walking on crutches Six additional patients of less than two months' duration are not upon crutches There is every reason to believe that the results in these cases will be as favorable as in those first reported

In no case has it appeared that the patient was harmed by the application of this bandage In no case did it produce pressure sloughs and require to be removed In but a few early cases did it need to be cut away at the edges on account of injury to the skin The plaster bandages were applied with great care and patience on the part of the House Staff to whose interest and effort much of the comfort of the patients were due In a majority of the cases the plaster bandage was not applied until several days had elapsed after the injury In six cases the patients had been under treatment in some other hospital before being transferred to Bellevue, four others had been treated at home for several days, and for other reasons this bandage was not at once applied In only three cases was it put on within three days after the accident Although the long side splints were in use, all these patients complained of pain whenever any movement was made—(in changing the sheets, in changing from one position to another, in lifting up to use the bed pan, etc.), the side splints did not

give sufficient support to prevent movement between the fragments

However after the plaster bandage was applied the patients found they could move about without pain and could help themselves in many ways. The nurses appreciated the many advantages which the patients gained through the comfort of a well applied plaster bandage. In general the patients were far more comfortable than others with similar fractures but under the routine treatment with the long side splint and Buck's extension. From the hospital standpoint this method of treatment is less exacting in that the patients being more comfortable do not require so much time and attention from the nurses.

*Conclusions*—1 Fracture of the neck of the Femur occurs under fifty years of age more frequently than was formerly believed

2 Any injury to the hip followed by disability should suggest the possibility of a fracture of the neck and requires an expert examination aided by an X ray photograph

3 Reduction of the deformity with complete immobilization of the fracture during the period of repair is advised by means of a plaster bandage in all suitable cases

4 This is to be followed by *early* gymnastic movements active rather than passive

5 All weight bearing upon the fracture is to be avoided for from three to four months

# THE OPEN METHOD IN THE TREATMENT OF POTT'S FRACTURE OF THE LEG

BY HOMER H HEATH, M D,

AND

CLARENCE D SELBY, M D,

OF TOLEDO, OHIO

Members of the Staff of St Vincent's Hospital

Of the great variety of fractures the surgeon is required to treat, that known as Pott's fracture, because of its close relation to the ankle joint, may be considered among the most important. Indifferent results following fractures of the various long bones, while often unsatisfactory, do not necessarily incapacitate the individual. In the instance of the ankle joint, however, and the so-called Pott's fracture, a very trifling deviation from a perfect re-alignment, oftentimes—we may say always—works to the disadvantage and discomfort of the individual, by virtue of the constant and exacting use required of the joint. Thus it becomes imperative for the surgeon, not only to apply a perfected knowledge of the normal relations of the parts that he may correct the pathologic arrangement produced by the injury, but also to affect a return to the normal in such manner as will insure permanency until rendered unnecessary by natural repair.

Pott's fracture is by no means a recent conception, for so long as man has existed has he been heir to this injury. And our knowledge of its pathology has come down through the medical ages hand in hand with our knowledge of anatomy.

The injury, itself, is best described by the manner of its production. Eversion of the foot is necessary. The strain is first manifested in tension on the internal lateral ligament, either in the ligament itself, or its points of bony attachment. As is usual in the test between bone and ligament, the bone

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\*Read before the Academy of Medicine of Toledo and Lucas County, November 23, 1906

gives way affecting in this injury a separation of the malleolus or a portion of it from its parent body the tibia. In addition the tendon of the *tibialis posticus* passing posteriorly and inferiorly to the malleolus is not infrequently torn from its compartment in the annular ligament and displaced forward and upward. This is very important. The force continuing pressure is exerted on the inner aspect of the external malleolus. This portion of the fibula being comparatively large and strong and as in the case of the internal lateral ligament the fibrous attachment of the fibula to the tibia even stronger the stress is carried to the slender part of the fibula 70 cm above the tip of the malleolus. This gives way and in this manner is caused the second element of a Pott's fracture. If the force be great enough the fracture of the fibula will be followed by a laceration of the inferior tibio-fibular ligament or more likely a separation of the outer lip of the articular surface of the tibia. With the exceptions of the rupture of the annular ligament on the inner side of the ankle joint and the dislocation of the tendon of the *tibialis posticus* this is what most authorities concede to be a typical Pott's fracture.

The philosophy of the treatment of this fracture is well understood and universally recognized except by an occasional radical who advocates early passive motion and kindred methods. As advised by our fore-bears in practice it consisted in reduction and the maintenance of reduction and will always unalterably so be. It is axiomatic that injured nature demands rest and given rest is amply able to care for herself. This is plea sufficient.

Methods and means of untold variety and quantity have been introduced from time to time. And it may seem strange but the early methods have stood the test of experience. This is quite in contrast to the progress made in other lines of practice. There are two reasons for it.

First and in the spirit of an eulogy for the grand masters of the past the original basic principles as worked out by them were correct—reduction and fixation. The devices which they in their ingenuity contrived were as good for the maintenance

of reduction as external appliances well can be, and in their splints early was the acme of progress reached. Simplicity was theirs. Modern adaptations have not changed the principle of fixation, nor the means. They have merely served to complicate the appliance and incumber the injured leg.

Second, and with due respect, these cases are too often treated medically when they should be treated surgically. There is yet a pre-Lister fear advising against opening injured joints, or cutting down on broken bones. However, the trend of recent times, encouraged by asepsis and the now recognized natural immunity of tissues, is to operate. Kelly, Martin, Vaughan and others are doing this over a wide range of fracture cases. While not advocating the radical use of surgical treatment in all fractures, we do suggest it here as the best means to reduce, and to maintain the reduction of, the Pott's fracture.

The successful issue of a Pott's fracture depends very largely upon the return-ability of the broken tip of the internal malleolus to its original position, in perfect approximation to the tibia. The slightest bit of tissue intervening means imperfect apposition and consequently imperfect union. It is true there may result an apparently perfect union, but it is, in that event, fibrous, and a fibrous union in this location, bearing as it does its share of the strain imposed on the arch of the foot, will not stand the test of use. Supporting this is the lack of confidence in the closed methods of treatment as manifested by the text-books. They are full of suggestions for the correction of faulty unions.

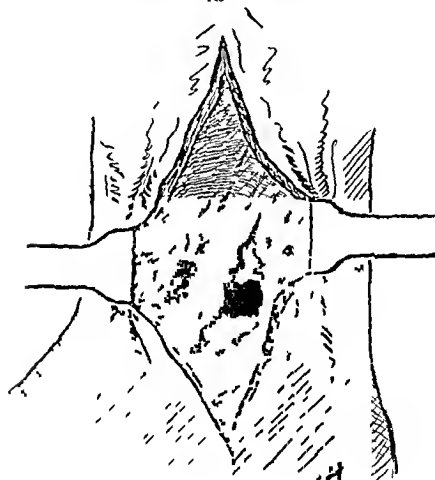
Not only is perfect union virtually insured when the fragments are sutured in place, but also the pain, so annoying to both patient and surgeon, in large measure prevented. In as much as this pain is due more to the impaling of nerve and muscle on the sharp points of fragments not wholly reduced than the trauma of the injury, this is consequently a very worthy argument in favor of the operative treatment.

The unfortunate and discouraging sequel of flat foot is obviated by the return of the tendon of the *tibialis posticus* to

its normal position in the annular ligament permitted by the open method

Swelling is likewise largely done way with Experience has demonstrated the very considerable hemorrhage a Pott fracture induces in and around the joint and it is reasonable

FIG



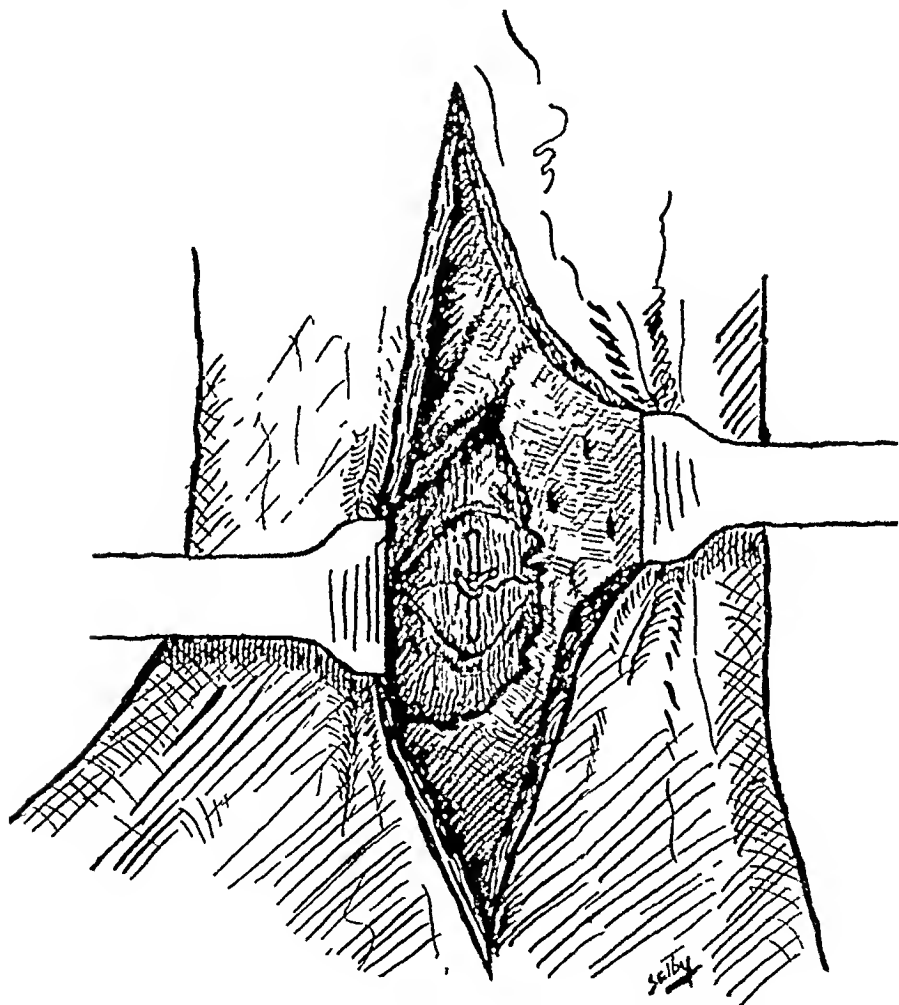
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to infer that swelling is consequent to this It is a granted fact that increased tissue tension is an inevitable cause of pain Likewise does it diminish the local resistance and hinder the natural power to heal Hence removal of the extravasated blood is indicated and a judiciously—mark you judiciously—

placed drain becomes a satisfactory adjunct to the suturing of the bones and the returning of the dislocated tendon

In order to illustrate the desirability, we may say the necessity, of having an improved method for the treatment of

FIG 2



Shows the malleolus sutured in place, the tendon of the tibialis posterior being retracted

the Pott's fracture cases, the two following reports have been abstracted from our records

CASE I—July 20, 1904, M V stepped on a round piece of iron which by rolling caused the ankle to turn. There was no apparent deformity, but passive abduction produced pain at the internal malleolus and demonstrated abnormal mobility. Pres-

sure over the fibula above the external malleolus caused pain but elicited no crepitus. He was removed to St Vincent's Hospital where the usual fixation dressing was applied. At the end of six weeks and in spite of conscientious care this ankle was found thickened and the arch of the foot fallen with ankle and foot functions impaired.

CASE II—January 5 1906 J S age 24 had his left ankle squeezed between a falling timber and a large block of wood. He was immediately taken to St Vincent's Hospital and examined under ether anaesthesia. Fractures of both the internal malleolus and the fibula were easily demonstrated. Having reduced these fractures fixation dressings were applied with the foot in marked inversion and adduction. At the expiration of eight weeks there was still considerable swelling but there was apparently firm union. However when put to the test abduction was found to be discouragingly developed and the foot disgustingly flat.

The results obtained in these two cases are not rare. It is safe to assume that all surgeons of large experience have recorded on their history sheets cases of similar nature and like result. Nor should the blame attach to the operator rather should we look to the method. With this in view we began casting about for a method that carried with it a greater element of accuracy in the reduction of the malleolar fragment for herein may it be conceded lies the fallacy.

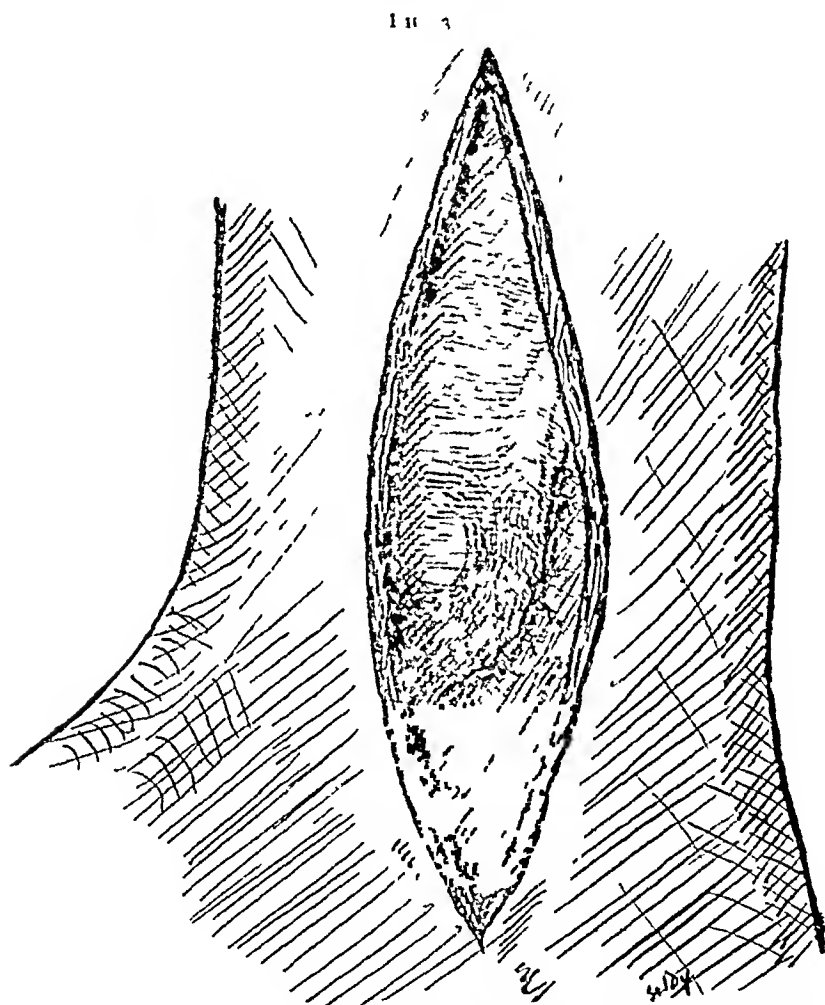
The growing popularity of the open treatment of fracture elsewhere with apparently increasingly satisfactory results determined its adoption in the treatment of our Pott's fracture cases. The first case so treated is detailed as follows.

CASE III—June 29 1906 J S age 64 while passing a moving crane was struck on the outer aspect of the right leg just above the external malleolus by a large bar of iron. The result was an outward and backward displacement of the foot. A first aid dressing was applied at the plant and the man removed to St Vincent's Hospital.

*Examination*—Ether anaesthesia was employed and when fully established the temporary dressings were removed. The striking features were marked outward and backward displacement of the foot with a sharply defined prominence in the region



of the internal malleolus. This deformity served to draw the skin on the inner aspect of the ankle so tight as to render perforation by the sharp prominence beneath imminent. Palpation demonstrated this projecting bone to be the lower end of the shaft of the tibia with its fractured edge, from which the malleolus had been severed. The malleolus was found 4 cm inferior and



Shows the suture of the annular ligament, which replaces the tendon of the *tibialis posterior* exterior to this edge, and freely movable. By some effort, the malleolus could be brought into its proper position, but would not so remain. The very considerable swelling about the ankle was regarded as being due to hemorrhage, and this was verified at the operation. The fibula was fractured 8 cm above the tip of the external malleolus.

*Operation*—The entire leg to the knee was prepared as for an abdominal operation but with perhaps even greater care. The incision was made where best it would expose the malleolar fracture and was longitudinal extending from the lower border of the malleolus upward over the shaft of the tibia to a point 5 cm above the fracture. The skin proved to be the only sound tissue covering the bone at the seat of the fracture and its incision was followed by a startling gush of blood the accumulation within the joint. The joint having been emptied bleeding was at no time excessive though there continued rather free oozing from the lacerated tissues. That portion of the annular ligament through which the tendon of the posterior tibial muscle passes was torn from its bony attachments permitting the escape of the tendon and its dislocation if we may use the term anteriorly. It was not necessary to develop the field except for light retraction of the skin which proved sufficient to expose the bony fragments. No effort was made to flush out the joint. In fact particular care was exercised that nothing should be brought in contact with the joint surfaces. The displaced malleolar fragment was brought upward into its proper position and there held by an assistant. Holes were drilled in both the tibia and the malleolus beginning in each instance in the middle of the exposed surfaces about 2 cm from the line of the fracture and carried to the fractured surfaces to points well toward but not involving the articular surfaces. Through these holes a medium sized silver wire was drawn and the ends sufficiently twisted to make perfect the apposition of the malleolus to the tibia. Anticipating the possible necessity of removing these wires later the twisted ends were not buried but were permitted to remain accessible. The anatomical relations of the lacerated annular ligament were then reestablished using a running over cast suture of chromic catgut No 1. Between the sutures and down to the bone a roll of rubber dam was inserted for the purpose of twenty four hour drainage. The skin was closed with the usual interrupted silk worm gut suture and a large bichloride dressing applied. The perfect reduction and retention of the malleolar fracture seemed to correct the fibular displacement so the fracture of that bone was not treated by operating. The usual splints were applied.

*Subsequent Course*—On the second day the drainage was removed. That the drainage had served its purpose was evi-

denced by the saturation of the dressings. In connection with this, it is interesting to note the patient had but slight pain, having passed a comfortable night.

On the seventh day the cutaneous stitches were removed, and at this time the patient was able to move the ankle quite freely and without pain.

During the fourth week, the patient complained of severe pain in the leg, which became quite swollen and hyperæsthetic. The silver wire was apparently the source of this trouble as it promptly subsided on the removal of the wire. Some fear was entertained lest union prove lacking in firmness. This, however, was not the case, and the result was in no wise influenced.

By the sixth week, the man was bearing some weight on the foot, and by the eighth was walking about with a cane. Owing to his advanced age, we had some doubts as to the propriety of allowing him to do this, even though union was seemingly complete. However, no untoward result followed.

*Condition at Time of Discharge*—September 11, 1907. The anatomical and functional results were perfect, as manifested by the ability of the old gentleman to walk without limping, and, furthermore, he was free from pain.

CASE IV—Our second case is reported in abstract, chiefly for the sake of emphasis. Oddly enough, this was in a youth of sixteen years, quite in contrast to the age of the first patient.

July 10, 1906, R. C., age 16, had his right foot caught and twisted between two pieces of iron causing an outward and backward displacement. Examination under ether anæsthesia at the hospital demonstrated a typical Pott's fracture. After a careful preparation, an incision was made over the internal malleolus disclosing a tear in the annular ligament with an anterior displacement of the tendon of the tibialis posticus and the separation of the malleolus from the tibia. The malleolus was restored and sutured with chromic catgut No. 4, the annular ligament with chromic catgut No. 1 and the skin with interrupted silk worm gut. A twenty-four hour drain of rubber dam was inserted between the stitches to the bone and a bichloride dressing of generous dimensions applied. The leg was placed in the usual fixation dressing. The convalescence was rapid and most satisfactory, and by the eighth week the young man had returned to his usual occupation.

Though we have other cases we have treated in this manner and as satisfactorily as the two reported we do not feel that the value of this paper would be enhanced by further details. We are frank to confess that the total number of our cases were they tabulated would make data far too meager to justify conclusions. Consequently we present these two cases as a preliminary report pending further investigation. There are however a few points relative to the method which deserve emphasis and they are as follows.

The first is a word of caution concerning the preparation of the injured part for the operation and we rather hesitate to speak of this as there is no surgeon who is not fully alive to the dangers of carelessly approaching joints. It were far better to have an occasional flat foot to one's credit than a single patient the amputation of whose infected limb became necessary to save his life. For such a weighty reason we offer a rule that if there be the least doubt as to the ability to secure an aseptic operation (under no circumstances operate outside of an operating room that is true and tried) do not operate. The preparation of the leg itself should be conducted with even greater care than that exercised in preparing the abdomen for operation. But these are well known facts and extended reiteration is not necessary.

Our first case developed an interesting feature in the pathology of the fracture and that is the displacement of the tendon of the tibialis posticus. It is a well known anatomical fact that this muscle is one of the essential supports of the arch of the foot. Having been displaced to its pathological location in front of the malleolus and thus happens by virtue of the forcible change in location of the malleolus the tendon lies lax thus failing in its function. Its replacement by external manipulation is obviously impossible. This of course argues for the open method.

As to the material used in suturing the fragments that is largely a matter of choice with the operator. The chromic gut seems to be sufficient however and has the added advantage of seldom being a source of subsequent annoyance.

## PUNCTURED FRACTURE OF THE SKULL \*

BY GEORGE G ROSS, M D ,

OF PHILADELPHIA, PA

Assistant Surgeon to the German Hospital, Surgeon to the Germantown Hospital

THE case herewith reported, as the basis of this paper, is unusual in many ways. It offered diagnostic difficulties which were completely solved only at the post mortem table, and has many points of interest, clinically, pathologically and in a legal way.

ADOLPH H. Age 21—On October 4, 1906, patient was seen by Dr L Demme Bauer. He gave a history of having been struck about the right eye with an umbrella, five days previously, on September 30th. The patient complained of a great deal of pain over the right temporal region, and of general malaise. He was entirely rational and answered questions intelligently. Physical examination showed that the right eye was the seat of a conjunctivitis, and the eyelids were puffy. There was no discoloration, ecchymosis or external evidence of any abrasion, in or about the eye. Both eyes reacted normally to light and accommodation, and the pupils were equal. The tongue protruded in the median line, and the naso-labial fold on either side unaffected. The temperature was 102° F, pulse 90, respiration 18. In spite of the fever there was an unusual coldness of the body. A boric acid lotion was ordered for the eye.

On October 5, 1906, the patient was again seen. His mental condition was still good, but the malaise was more marked. There was no paralysis of the extremities. The temperature was 102°. He was removed to the German Hospital in the afternoon.

Patient is a well-nourished and well-developed German lad. He is in a stuporous condition, and answers questions slowly and incoherently. He lies upon his back, with his eyelids closed, and desires not to be disturbed, but occasionally tosses his head from side to side. He complains of chilliness, and a great deal of tenderness over the right temporal region. There was no evidence of alcoholism or uremia.

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\* Read before the Philadelphia Academy of Surgery, October 1, 1907

The head was carefully examined and no evidence of fracture was detected. There were no cuts or bruises on the scalp. There was no discharge from the nares or from either external auditory meatus. There was no oedema over either mastoid. The tongue was protruded in the median line without tremor. There was no facial paralysis. There was no cyanosis of visible mucous membrane on the lips or of the finger tips. The right eye showed slight injection of the bulbar conjunctiva but there was no evidence of injury to the eye. Both eyes reacted normally to light and accommodation and there was no irregularity of the pupils. The sclera was not icteroid.

The chest, heart and lungs were negative. The pulse was slow and regular. The abdomen was negative. The patient having been sent in with a suspicion of enteric fever was examined very carefully for enlarged spleen and spots and for a history of nose bleed all of which were negative. The extremities could all be moved. The superficial and deep reflexes so far as examined were unaffected. Temperature 99.2.5 pulse 64 respiration 22.

A catheterized specimen of urine 570 c.c. had a reddish yellow color, acid reaction, specific gravity 1.038, faint trace of albumin and many amorphous urates but no tube casts.

At 12 o'clock midnight, October 5, 1906, the temperature was 102.2.5, respiration 24, pulse 64. During the night the patient was very restless, talking constantly and complaining of a great deal of pain in the head. He passed 1060 c.c. (35 ounces) of urine during the first twenty-four hours in the hospital. October 6, 1906. Leucocyte count 15,000.

October 7, 1906. About 10 A.M. it was noticed that the right pupil was more widely dilated than the left but still reacted to light and accommodation. No evidences of paralysis were yet found but a tentative diagnosis of cerebral pressure was made, the possible causes considered being either depressed fracture, a clot from rupture of some portion of the meningeal artery or its branches, or a collection of pus. The diagnosis of cerebral abscess was suggested by the intermittent temperature, leucocytosis and the chilly feeling of the patient.

The X-ray of the skull showed a shadow which was interpreted as a fissured fracture of the vertical plate of the frontal. This opinion was not positive. The patient grew worse and on

the night of October 7th, became very delirious, and tried to get out of bed Morphia  $\frac{1}{8}$  gr was given and quieted the patient

October 8, 1906 Patient had become quite comatose and the right pupil was widely dilated There was no paralysis of either arm or leg The patient's condition in other ways was as twenty-four hours before

An eye examination was made by Dr Wm T Shoemaker O D and O S react to light and accommodation O D, dilated pupil O S, normal pupil Ophthalmic examination O D shows slight obscuration of disc No hemorrhage into retina

Soon after this examination was made it was noted, that while the patient was moving his right arm and leg, the left arm and leg were limp by his side One hour before this, however, the resident physician saw the patient move his left arm and leg, and a patient in the adjoining bed saw him attempt to get out of bed, using his left arm and leg in doing so An examination showed a complete left-sided hemiplegia The indications of intracranial pressure were now unmistakable, and operation for relief was decided upon and performed about 5 P M, October 8th

*Operation*—October 8, 1907 Ether anæsthesia A curved incision, with its center over the most prominent part of the parietal eminence, was made It started some distance behind the right ear, and was carried upward and forward The tissues were divided down to the bone A one-inch trephine opening was made over the most prominent part of the parietal eminence, and was enlarged with a rongeur forceps The dura bulged into the wound It was opaque, non-pulsatile, and dark underneath The dura was incised, and a large abscess of 150 to 200 c c of dark, foul-smelling pus evacuated The brain then came down into the opening and pulsation became evident The abscess cavity was carefully and thoroughly wiped out with gauze sponges

Three pieces of iodoform gauze were placed in the abscess cavity for drainage, the ends being brought out of the opening The skin wound was closed with interrupted sutures of silk-worm gut, room being left for gauze drainage to come out An anti-septic dressing was applied

After coming out of the ether the patient was semi-conscious, could be aroused with little difficulty, and had periods of restlessness alternating with stupor Such was his condition all of the

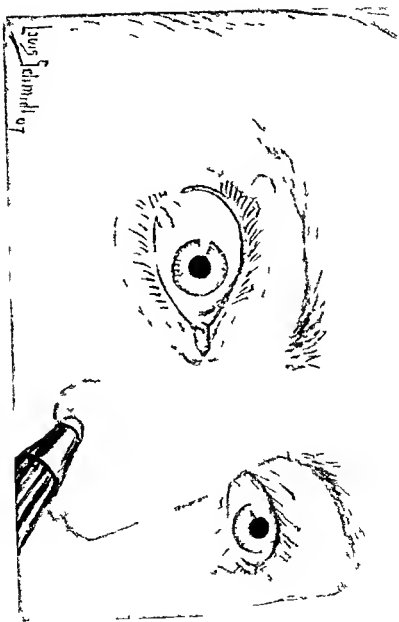
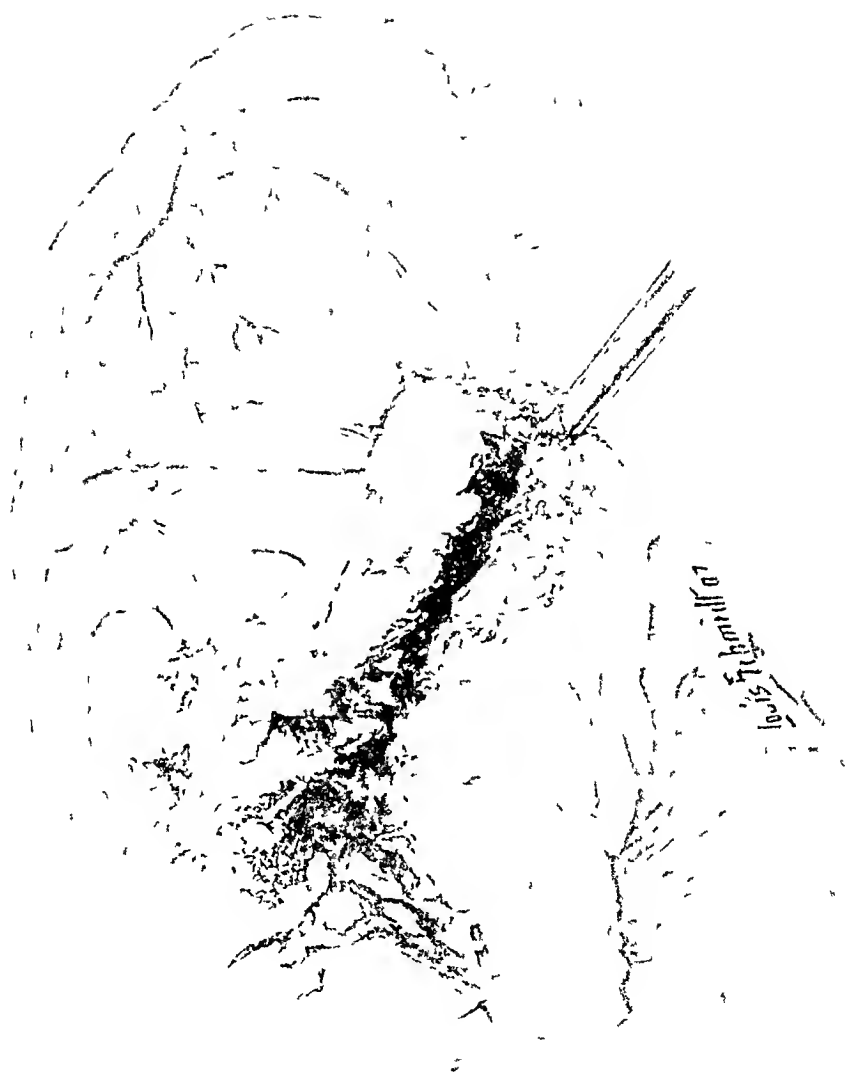




FIG 2



next day October 10th The right pupil was dilated and did not respond to light The left side still paralyzed The outer dressing was changed and the wound was found to be discharging freely

October 10th In the morning the patient was improved He answered questions in a fairly rational way his pupils were equal and reacted to light and the paralysis of the left arm was not so profound

At 10 25 A M the patient suddenly stopped breathing and became deeply cyanosed The pulse remained full and strong for two to three minutes after breathing ceased Artificial respiration was performed without avail and the pulse gradually weakened and stopped

*Post Mortem Examination*—The face and head presented no external evidences of injury There was no ecchymosis or swelling about the eyes or forehead

The skull cap was removed and the brain exposed A large abscess cavity about the size of a large orange was found in the right temporo-sphenoidal lobe An investigation of the middle fossa showed a fracture of the greater wing of the sphenoid a little below and to the outer side of the outer end of the sphenoidal fissure Several loose spicules of bone were removed and the fracture opening was found to be nearly circular The right eye was removed exposing the floor of the orbit A fissured fracture with a loose fragment of the bone was found opening the roof of the antrum of Highmore The antrum was full of pus and showed a fracture of the inner wall into the nose The line of penetration was then from before backward from nose to antrum antrum to orbital cavity and thence to the middle fossa of the skull thus furnishing an avenue of infection direct from the nasal cavity to the temporo sphenoidal lobe of the brain A straight probe could be made to traverse the entire tract without obstruction

The instrument of penetration had traversed the fatty bed of the eyeball and had not infringed upon or in any way injured the eyeball its vessels or nerves thus accounting for the lack of ecchymosis or permanent swelling (Figs 1 and 2)

A septic embolus having the appearance of a chicken fat clot and about the size of a small bean was discovered in the floor of the fourth ventricle This explains the sudden death

from respiratory failure. There was no evidence of any intracranial hemorrhage, either extradural or subdural. The inner wall of the mastoid cells seemed normal and intact. The rest of the body was normal in every respect.

In looking over the literature of Punctured Fractures of the Skull I have failed to find a similar case. The vast majority of punctured fractures of the skull are, as would be expected, the result of bullet wounds received in battle, and come under the hands of military surgeons. The majority of these cases are instantly fatal or live so short a time that secondary results do not supervene. This is particularly true of wounds caused by the modern high velocity bullets, the injury to the brain in these cases being highly destructive. In civil life the wounds are caused generally by other instruments or by low velocity fire-arms. Here the skull offers enough resistance to take up most of the energy, with the consequent low grade of injury to the intracranial organs, and hence these cases often survive the injury long enough to permit of the development of hæmorrhage and infection. These are the two great dangers of punctured fractures in those cases which do not succumb at once. The hæmorrhage is most often subdural. The infection may involve the cerebrum, the meninges or both, and any portion of the brain may be the seat of an abscess.

In a series of 316 cases of foreign bodies in the brain analyzed by Dr. Henry Wharton in 1879<sup>1</sup> a number of cases of punctures by objects other than bullets are recorded. Gun-shot wounds of the skull and brain I have not attempted to include in this summary of the literature. In Dr. Wharton's series there were stab wounds by swords and bayonets, and wounds caused by the ferrules of canes and umbrellas. Five cases of penetration of the sphenoid bone are recorded, and 18 of wounds of the orbit.

Since that time numerous cases have been reported.

Brown and Birch,<sup>9</sup> Ferguson,<sup>10</sup> Lemonnier,<sup>28</sup> Fisher,<sup>11</sup> H. M. Holmes,<sup>13</sup> Mac Kellar,<sup>16</sup> Wilson,<sup>18</sup> Beckwith,<sup>19</sup> Taylor,<sup>20</sup> D'Cruz,<sup>22</sup> Schmid,<sup>21</sup> Odell,<sup>25</sup> Batut,<sup>28</sup> and Kennedy,<sup>29</sup>

have reported cases of simple puncture of the skull not followed by abscess

Felty<sup>1</sup> Rehm<sup>2</sup> Glasgow<sup>32</sup> Mandel<sup>3</sup> and P. Ross<sup>1</sup> have reported punctured fractures of the skull followed by cerebral abscess

Griffith<sup>30</sup> has reported a case of cerebellar abscess following puncture of the skull and bruise

Dutra<sup>4</sup> Laplace<sup>7</sup> A. S. Holmes<sup>1</sup> Jewett<sup>14</sup> Lusk<sup>15</sup> Prideru<sup>1</sup> and Grekoff<sup>7</sup> have reported punctured fractures through the orbit with brain injury but not followed by infection while Builer<sup>8</sup> and Lee<sup>4</sup> reported similar injuries followed by abscess and meningitis

Randall has reported a case (quoted by Spiller) of perforation of the ethmoid through the nose by the rib of an umbrella with secondary cerebral abscess. I reported a case to this academy last year of a puncture of the vertex of the skull in which the superior longitudinal sinus was opened. The case recovered and there was no infection. I also know of another case in which the olfactory plate of the frontal was perforated by the rib of an umbrella which entered the nose. This case was fatal.

In practically all of these cases the diagnosis of the primary and secondary conditions was made easy by a knowledge of the injury and local evidences of trauma. In the case here reported however we did not have these facts to guide us. The history in itself meagre was misleading as no indication of an injury to the nres was present on superficial examination. The diagnosis of a cerebral abscess could not be made with certainty. At best the recognition of this condition is a matter of difficulty.

There is no symptom or combination of symptoms pathognomonic of brain abscess therefore in the absence of a recognized fracture middle ear infection or suppuration elsewhere in the body its diagnosis must be doubtful.

Spiller Penn Med Journ Oct 1906 P 30 says The diagnosis of cerebral abscess depends chiefly upon the signs of some more or less rapidly developing lesion of the brain with

the discovery of a purulent process somewhere else in the body or of a wound of the head" Note the qualifying clause

Von Bergman states that marked symptoms of localization, provided they are accompanied by headache and fever, constitute the most important signs of cerebral abscess He also lays great stress upon the condition of the skull wound, when one is present, and upon the flow of the pus from the fissure in the skull or from between the fragments of a comminuted fracture

Leucocytosis of course may aid us in the diagnosis of abscess, as may also at times the presence of choked disc—not found, however, in the case I here report The main features upon which we had to form our opinion in this case were

1 Pain in the right temporal region 2 Tenderness in the right temporal region 3 Leucocytosis 4 A persistent feeling of cold 5 The intermittent temperature 6 Persistent slow pulse

The factors which operated against the establishment of a positive diagnosis were 1 Existence of fracture without external evidence of injury 2 Delay of paralysis until the abscess was large enough to cause pressure on the motor area 3 Absence of choked disc

The diagnosis was not made definitely and this is not surprising in view of the facts The operation was undertaken primarily for the relief of intracranial pressure

Granting that the existence of an abscess or of other serious intracranial complications can be established, operation is of course indicated, and indeed operation offers us a better chance in punctured fracture of the skull when the signs of intracranial lesion are not well marked, or even absent In making this statement, I am taking into consideration the great mortality in fractures of this kind especially when they traverse the orbit In Dr Wharton's series, 17 of the 18 cases of orbital penetration died, although it is stated by him that "in many cases the persons were unconscious of the injury and the unfavorable symptoms developed suddenly"

Therefore it is a wise procedure to open the skull at the

wound of entrance at the earliest possible moment after the accident irrespective of symptoms or lack of symptoms. The fatality of brain abscess or septic meningitis is so great that any procedure looking toward prevention is imperative. When as in this case the history of the injury is vague and no wound of entrance can be found the indications for early operation are not so positive.

In conclusion I would call attention to the wisdom of nose examination in any case of traumatism about the head when the history is at all doubtful or undetermined.

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# TRANSACTIONS

OF THE

## NEW YORK SURGICAL SOCIETY.

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*Stated Meeting, Held October 9, 1907*

DR JOSEPH A BLAKE in the Chair

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### PRIMARY CANCER IN ACUTELY INFLAMED APPENDIX

DR CLARENCE A McWILLIAMS presented a single woman, 20 years old, who was admitted to the Presbyterian Hospital on September 5, 1907. She had landed in this country only two days before, and was brought to the hospital from Ellis Island. She had been sick with right abdominal pain for 3 days. Her temperature on admission was 101, pulse, 100, she was vomiting and complained of a pain in the right iliac fossa, where a tender mass, about the size of a lemon, could be felt over the appendix. This was her first attack, never having been sick before in her life in any way.

An immediate operation was done, the abscess containing three ounces of pus being opened and the appendix situated in the pelvis delivered in the ordinary way. It seemed to be swollen, acutely inflamed, with a small perforation at the base and clubbed at its extremity. The patient made an uneventful recovery.

Pathological examination of the appendix. Specimen is 7 x 1½ cm. On gross examination all the layers seem hypertrophied. Peritoneal coat is darkened and bloody. Lumen contains muco-pus and a few enteroliths of small size. At the tip the lumen is entirely occupied by a hard mass about the size of a pea.

Microscopical examination. The epithelial layer is mostly intact. The submucosa and muscularis show not only chronic productive inflammation but they are also at the tip infiltrated by an epithelial growth having the histological character of scirrhus.

cancer The columns of cells in the central tumor pass outward and split up the muscular fibres They involve the subperitoneal tissue but not the peritoneal coat The cells are spheroidal shaped and show no mitotic figures indicating slow growth

Dr McWilliams said that up to June 1906 42 cases of undoubted malignant tumors of the appendix had been reported Of these acute inflammation was found in 13 cases obliterating appendicitis in 11 and concretions present in only 3 cases Of these 42 cases 37 or 88 per cent were cancer 3 were endothelioma and 2 were sarcoma Since the above report he has been able to find 8 additional cases making 50 in all These were as follows 1 case Libman *Proc N Y Path Soc* 1906 No VI 2 cases Mandlebaum *Proc N Y Path Soc* 1905 1 case Mason *Boston Med & Surg Jour* Jan 10 1907 1 case Eccles *Amer Jour Med Soc* 1906 131 p 966 2 cases Hartman *Bull et Mem de Soc de Chir de Paris* 1907 March 12 p 28 1 case Nelaton *Bull et Mem de Soc de Chir de Paris* 1907 March 12 p 228

Routine microscopical examinations of all removed appendices will undoubtedly reveal cancer of the appendix to be more numerous than has been supposed to be the case Its development also in appendices diseased previously by either acute or chronic processes would indicate the advisability of removing the organ when it is known to be once damaged

#### OPERATION FOR ANCHYLOSIS AT THE SHOULDER JOINT

DR ROYAL WHITMAN presented a girl fifteen years of age who came to the hospital five weeks ago for pain and stiffness at the right shoulder joint of ten years duration apparently due to tuberculous disease He had removed the head of the humerus and the diseased portion of the scapular articulation and had then interposed a flap from the deltoid muscle The objects of the operation were first to relieve the pain and second to restore a certain degree of motion Both were apparently accomplished

In this case Dr Whitman said the head of the bone was diseased and adherent to the scapula Mobility after excision depended more upon the amount of bone removed than upon the interposition of tissue In this instance only the articulating extremity of the humerus had been resected in order that the contour of the shoulder and the muscular attachments might be preserved a large flap was interposed to prevent readhesion



DR JOHN F ERDMANN said that some years ago he reported three cases of excision of the shoulder joint for ankylosis in which the results were very satisfactory. In those operations he did not interpose any muscle flap.

#### EPIPHYSEAL FRACTURE OF THE NECK OF THE FEMUR.

DR WHITMAN presented a girl fifteen years of age who was admitted to the hospital about ten weeks ago. The symptoms were, as is the rule in fractures of this type, originally incomplete, limp and pain for several weeks terminating finally after a slight injury in complete disability. She was sent to the hospital with a diagnosis of hip disease. There was severe pain on attempted motion, the limb was rotated outward and practically fixed by muscular spasm. There was a fraction of an inch of shortening. The joint was opened by the antero-lateral incision which exposed at once the inner extremity of the neck of the femur which completely concealed the head of the bone separated and lying behind it. On removal of a thin section from the end of the neck, it was possible by the insertion of a chisel to separate the fragments and by rotating the limb inward to restore their normal relation.

There was now no pain, motion was practically unrestricted and perfect functional recovery might be predicted. The case illustrated the importance of a correct diagnosis which permitted operative intervention, for untreated the result must have been shortening, ankylosis and distortion of the limb.

#### FRACTURE OF THE NECK OF THE FEMUR

DR CHARLES N DOWD showed a girl, 10 years old, who sustained a fracture of the neck of the femur about three years ago. There was no lameness, and no shortening could be made out at the present time. The child was able to run about and play as well as though she had not received the injury. The X-ray, however, still showed considerable deformity, consisting of a depression of the neck of the femur. That femur had, however, apparently grown more than the other and hence the legs were of equal length. The case was treated in March, 1904.

#### OBSERVATIONS ON THE TREATMENT OF FRACTURE OF THE NECK OF THE FEMUR

DR JOHN B WALKER presented a paper with the above title, for which see page 84. In connection with the paper the author showed two cases of fracture of the neck of the femur.

DR WHITMAN said that in the last edition of Hamilton's work on Fractures he had recently noted a quotation from Robert Smith as to the prognosis in fracture of the neck of the femur as follows. In all the functions of the limb are forever impaired. Whether the fracture is within or without the capsule whether united by ligament or bone shortening of the limb and lameness are the inevitable results.

The two patients presented by Dr Walker thus disposed of another tradition. The speaker said that for the past eighteen years he had been writing papers and presenting cases to prove that this accident was not uncommon in young and vigorous subjects. He had seen upwards of forty cases of fracture of the neck of the femur in childhood and many cases in young adults. The neck of the femur was a weak point and it might be broken by slight violence if advantageously applied. Until these facts were accepted by teachers this fracture would continue to be overlooked in the most favorable class of cases by those who had the opportunity to make the diagnosis when effective treatment might be applied. He was particularly interested in cases of this class. For example the incomplete or impacted fracture at the base of the trochanter was supposed to be relatively common in young subjects. The present teaching was that no treatment should be employed other than to prevent disengagement consequently all recovered with a limp which was usually complicated by adduction of the limb and practical shortening. He believed that the attempt should be made to rectify the deformity by gentle traction and abduction followed by immediate fixation in the manner that he had described. He said the cases presented by Dr Walker were of particular interest to him because the method had been applied by those who had no previous experience or special training in the use of plaster of Paris.

DR ERDMANN said that a few days ago he was called in consultation to see a case of retention of urine in a patient who had sustained a fracture of the femur about seven years ago. The limb was put up by him in abduction and rotation the method described a year later by Whitman and the result was absolutely perfect in spite of the fact that no special devices such as the one demonstrated by Dr Whitman were made use of.

Dr Erdmann said he had recently had two cases of fracture of the femur in aged people where it did not seem advisable to

give an anæsthetic. Instead of confining those patients to bed, he had them comfortably fixed in an invalid's chair.

DR ROBERT H. M. DAWBARN said that one of the speakers à propos of the statement by Dr Walker that the Bellevue statistics showed a large percentage of their patients dismissed at the end of fifteen days, with fracture of the femoral neck—had criticized this early dismissal as indicative of careless treatment—to use his own words. Dr Dawbarn thought it fairer and more just to assume, instead, that they had deliberately chosen the second horn of the dilemma presented by these fractures when in old people—the ordinary choice being between attempted bony union with its probably months of immobilization upon the back, with Buck's extension with pulleys and heavy weights—and the terribly frequent result of death from hypostatic pneumonia, or as the second horn, to attempt no union of the fracture, but after recovery from any possible shock, to dismiss the case to permanent lameness and use of crutches.

Dr Whitman's ingenious plan deserves a fuller trial than in adults it has yet had, and Dr Walker's results are certainly excellent. In a single point would Dr Dawbarn venture respectfully to differ from him—namely, his approval, in his paper as printed, of separating however gently, the fragments in an impacted fracture here—unless the limb should be found rotated so very far outwards or (rarely) inwards as to constitute a really objectionable deformity. Otherwise, and if in later moderately good position of the fragments, an impaction is a blessing.

Dr Dawbarn thought the present a most appropriate opportunity in which to present briefly the main points of yet another plan of handling, with good reason to hope for bony union and this accomplished both simply and safely. This was the nailing together of the fragments, not by a formidable open operation such as have sometimes been done with success, involving detaching the glutei muscles, dividing the capsule and wiring or spiking the fragments openly. Instead, after from one to three days in bed with Buck's extension, until the normal relationship of the fragments is restored, as ascertained chiefly by comparing the lengths of the base-line of Bryant's triangle, upon both sides, the patient's skin is prepared for operation, which is done in from ten to fifteen minutes depending upon depth of subcutaneous fat. The work is done without removing the patient from the cotbed,

nor displacing the steady tension from the Buck's extension. It is painless because of cocaine injecting  $\frac{1}{2}$  of one per cent in the skin and  $\frac{1}{10}$  to  $\frac{1}{20}$  of one per cent beneath and in the periosteum. The bone interior needs none—thus far in his experience. The incision has its midpoint about 3 inches below the top of the great trochanter. After drilling through the dense bony cortex a long slender steel trochar is introduced in a direction between 125 and 130 degrees from the long axis of the shaft also *forward* remembering the normal direction in which the femoral head looks relatively to its trochanter major. It is very easy to recognize the feel of the dense bone of the cortex of the head as approached by the probe-like trochar. One may deviate at least five degrees from that estimated in any direction and still if starting his nail at the proper point upon the outer and posterior surface of the shaft (about three inches in a six foot man below the trochanter top) his nail or spike will be within the interior of the bone. The previous examination by a steel probe makes sure of this. In one case the trochar met with positive obstruction before reaching the nearest possible point where a fragment of broken femoral neck could account for this. Upon raising the advancing searcher a little it passed beyond without further trouble. Plainly this was the apex or upper edge of the

Schenkelspoon. The average length of smooth round steel nail used is at least three inches. If its point is nearly in contact with the cortex of the head its base will be buried then more than an inch within the bone of the shaft in a femur of ordinary dimensions. The head is filed off and the base so made is slightly hollowed to prevent slipping of the nail set — i.e. a similar but unfiled nail used to drive the first home.

In course of years this nail should either—like other small sterile pieces of iron or steel buried within the body—gradually change to ferro and slowly disappear or else remain encysted and harmless. In one case he had used an aluminum spike instead of steel—expecting its absorption by the alkaline activities of the blood serum into aluminum hydrate.

Dr. Dawbarn said his cases have as yet been but few and only one in private practice. That one an old lady of over seventy had originally close to one and a half inches of shortening. She was of course kept in bed as many weeks as if no spike had been used but without the danger of the hypostatic pneumo

nia, because, when spiked, and the Buck's extension removed, she did not remain long upon her back, nor in any other one position. She could safely turn in any posture in bed, although doubtless in the early weeks the union would have given way had she attempted to stand. The final result was excellent. Both base lines of Bryant were apparently of the same length. The patient herself, however, was not at all satisfied. She had recently developed a bad case of the scoliosis of the aged, and it advanced speedily in deformity. Her broken thighbone was her right one. The major curve of her scoliosis was as usual toward her right in its convexity, the minor curve below being of course toward the left, and this lifted her right hip strikingly, and of course produced an apparent shortening of the femur not really present. Added to this there was rheumatic pain in the involved hip-joint.

DR WHITMAN asked Dr Dawbarn if he recalled the work of the surgeon who had devised the method of spiking the two fragments in fracture of the neck of the femur? He, Nicolayson, drove the nail through the neck and into the acetabulum without an anæsthetic. The results were apparently good. His own objection to the method was that nails do not as a rule serve as persistent supports, but become loose. He preferred therefore to insert a strong drill which could be more easily directed by means of a handle, and when detached could be driven beneath the skin. When it loosened it could be easily removed through a small incision.

DR DAWBARN, in reply to Dr Whitman, said he did not recollect the name of the Swedish surgeon who had long advocated spiking, and who does extensive operation, and even has spiked deliberately the femoral head to the acetabulum which the advancing nail intentionally pierces.

As to the further inquiry of Dr Whitman whether the permanently remaining nail may not set up a softening and disease of the surrounding bone with time. We used often to see that and indeed occurring in a few weeks time, when as formerly was the rule, spiked the bones together after sawing, in operating, for instance, upon a tuberculous knee. But these bones, while not tubercular to the eye where spiked, are undoubtedly far from normal. Osteoporosis would therefore readily occur, when no such thing would result in bones not of a tubercular diathesis.

To hasten the exudate of callus in these femoral neck fractures in the aged Dr Dawbarn had used in the case of the old lady referred to an injection all along the track of the nail within the bone of the mixture (half pure glycerin half glycerite of tannin (U S P) boiled together) of which he spoke at another A M A meeting last June advocating its use in non union of fracture when due to insufficient callus exudate and not as most commonly is the case instead due to some local trouble such as lack of good apposition or to soft tissues torn and interposed

DR WALKER in closing the discussion said that in one case of fracture of the neck of the femur of eighteen months standing he had resorted to the use of the spiking process referred to by Dr Dawbarn and about two months later he found the nail very loose He thereupon made a small incision and with the aid of a pair of forceps it was removed without any trouble In old people—old in years or on account of disease—he did not resort to the use of an anæsthetic

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*Stated Meeting October 23 1907*

The President DR GEORGE WOOLSEY in the Chair

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#### EXCISION OF ANTHRAX PUSTULE

DR CHARLES L GIBSON presented a man 49 year old a native of Ireland and a longshoreman by occupation During the past year he had at various times assisted in unloading large numbers of ox hides shipped at New Orleans One month previous to his admission to the House of Relief he had assisted in unloading 1 500 hides carrying them upon his right shoulder These hides had been through only the preliminary process of tanning and the hairs had not been removed

Two days prior to admission the patient noticed a small papule on the right side of the neck which was irritated by the collar of his jumper rubbing against it On the day after the appearance of this papule he became quite weak and felt sick but he did not complain of pain He went to bed about 5 P M and was awakened about 3 A M with the pain and swelling of the neck He visited the hospital the following morning but refused treatment That evening he was again brought to the hospital

in a very weak condition, with marked constitutional symptoms, his temperature on admission being 102° F, pulse, 104, respirations, 24

The case was recognized as one of anthrax pustule, and the lesion was immediately excised. The wound was then thoroughly swabbed with pure carbolic acid and eight drams of a five per cent carbolic acid solution were injected into the adjacent tissues, followed by a wet carbolic acid dressing. This was repeated on the following day. The patient at this time felt well, and his temperature rapidly fell to normal.

A blood culture in this case was sterile. The lesion that had been excised was submitted to a pathologist, who reported as follows: Central part revealed a hemorrhagic, slightly elevated area. The epithelium covering this was maculated, and on section presented a peculiar hemorrhagic and necrotic appearance. About the central area numerous vesicles were seen. Microscopically the lesion gave the usual appearance of anthrax. There were an unusually large number of anthrax bacilli present.

#### EXCISION OF THE TONGUE UNDER ANAESTHESIA PRODUCED BY SEQUESTRATION ANAEMIA

DR ROBERT H M DAWBARN presented a man 46 years old, who was referred to Dr Dawbarn by Dr Ferdinand S MacHale, of this city, because of a leucoplakia lingualis of three years' standing. The entire dorsal surface of the tongue was covered with great numbers of small milky patches, while the anterior third of the tongue had undergone superficial ulceration at the site of each such patch, within the previous month, for the first of this phase of his disease. Dr Jeffries declared this area of ulceration to be typical epithelioma. The patient was operated on at the New York Polyclinic Hospital, the anterior two-thirds of the tongue being removed. Quite a number of the patches of leucoplakia on the dorsal surface of the tongue were left behind rather than remove the entire organ, with consequent extreme risk of death soon from *Schluckpneumonie*, and subsequently disappeared spontaneously, the man having stopped smoking for the first time in many years. (Also, he had formerly carried the habit to great excess.)

In addition to the removal of the tongue, the sublingual and

submaxillary salivary glands and the greater part of the adjacent tissues as usual were extirpated and submitted to Dr Jeffries who reported that they contained typical cancer lymph nodes. Enlarged nodes at and below the carotid bifurcation were also found and removed. During the entire operation which occupied an hour and a half less two minutes the patient was made to sit bolt upright. The lower extremities were first corded as close to the trunk as possible in order to secure what has been termed for lack of a better and equally brief name sequestration anemia namely the temporary removal of considerable blood from the head neck and trunk and its accumulation in the limbs usually the lower ones by cording of proper degree for this purpose. The anæsthesia (ether) was withdrawn as soon as the cording process was completed and the operation commenced. The patient was able to endure the long operation (really three of them as stated) without any further anæsthetic at all sleeping quietly through the work in this so sensitive region. One hour before beginning the operation he had received two ounces of whiskey diluted and a hypodermic of one quarter grain of morphine combined with one one hundred and fiftieth of a grain of atropine. This is Dr Dawbarn's routine before any form of anæsthesia whether general or local. It will be admitted the doctor thought that this preliminary treatment given chiefly to prevent fear and induce cheerfulness to avoid risk of psychic shock would not go far to explain *per se* the satisfactory anæsthesia. Upon the completion of the excision of the anterior two-thirds of the tongue Dr Dawbarn made a small slit into the intrinsic muscle of the remnant of the tongue and into this he inserted the distal end of the twelfth nerve fastening it there with a very fine chromic stitch or two through its sheath with the idea of aiding a quicker return control of the epiglottis during the act of swallowing by this contact of the motor nerve with the muscles. This step he has long employed and cases describing it were published in his Gross prize essay. About ten days after the operation the patient through some misunderstanding of positive orders was allowed to sit up for only a couple of hours. In consequence just as was feared he promptly developed symptoms of *Schlued pneumonia* entirely central as it proved and thus painless but with initial chill very high fever and some bloody expectoration after coughing. His life was seriously jeopardized.



but he came through, making, however, of course, a slower convalescence. The speaker said he had become convinced that after excision of the tongue the patient should be kept with the head low enough to avoid permitting the rankly dangerous pus and saliva gravitating into the air passages—since the epiglottis could no longer protect the larynx, for a period of time varying, of course, with the age and vitality, and the proportion of tongue left. The mouth should also be kept as cleanly as possible by hourly use, by the patient himself, of a fountain syringe for irrigation. The head should not be allowed raised at all until the mouth is at length free from all sloughs and from offensive odors. At this time the ice-water test should be used, namely, immediately after thorough cleansing of the mouth, the patient, permitted up for the moment, attempts to swallow a little ice water. If this can at last be done without inducing coughing, he is safe. Otherwise he should again lie with head low, no matter if weeks longer, until the stump has finally learned to control the epiglottis. Dr. Dawbarn said he has repeatedly published cases, two of them in his book mentioned, giving absolute proof of the danger of pneumonia, and consequent death, from following the usual teaching—that is, allowing patients up almost at once—"the sooner the better"—after such an operation. It cannot be discouraged in too strong terms.

In conclusion, Dr. Dawbarn said he did not at all wish to assert that satisfactory anesthesia without continuance of ether will always—perhaps not even very often—result from the anemia—like that of normal sleep, apparently—caused by the sequestration method used in this case.

#### LEUCOPLAKIA LINGUALIS

DR. DAWBARN also presented a man, 63 years old, who had been operated on by Dr. Edward Milton Foote on March 19, 1907, in the City Hospital, for a leucoplakia lingualis of some years' standing, with a cancerous nodule on the left side of the tongue. About one-half to two-thirds of the tongue was removed, together with the submaxillary glands and the adjacent lymphatics. In this case no cancerous nodules were found within the glands. Dr. Foote's case was accompanied by several excellent drawings from the microscopical slides, showing the epithelial cancer.

## HODGKIN'S DISEASE TREATED WITH THE MIXED TOXINS OF ERYSIPELAS AND BACILLUS PRODIGIOSUS

DR WILLIAM B. COLEY presented a man 25 years of age who was admitted to the General Memorial Hospital on October 10th with the following history

About a year ago he noticed a tumor in the right side of the neck behind the sterno mastoid muscle which was apparently an enlarged gland. It was smooth in outline and freely movable. Shortly afterward a similar tumor occurred in the neighboring gland. A few months ago like enlargements were noticed in both axillæ and in the groin. On the day he was admitted to the General Memorial Hospital October 10th he was examined by Dr Wm K. Draper attending physician to the hospital who pronounced the case undoubtedly one of Hodgkin's disease. The patient had had no treatment prior to his admission.

Physical examination on October 10 1907 showed the whole right side of the neck from the mastoid to the clavicle occupied by a large number of tumors apparently starting in the lymphatic glands both anteriorly and posteriorly to the sterno mastoid muscle. The tumors varied from the size of a Lima bean to that of an English walnut. The skin was not adherent and the tumors were fairly movable upon each other and upon the deeper structures. There was only slight involvement of the glands of the left side of the neck. Both axillary regions were occupied by similar tumors. The glands in both groins were also markedly enlarged. Examination of the abdomen showed the spleen enlarged and easily palpable extending about one inch beyond the costal arch.

Examination of the blood showed the following: Leucocytes 4050 red blood cells 4070000 polynuclear 62 per cent large lymphocytes 18 per cent small leucocytes 17 per cent transitionals 3 per cent.

Being strongly of the opinion that Hodgkin's disease is really a type of sarcoma of the lymphatic glands rather than a separate disease Dr Coley immediately placed the patient upon small doses of the mixed toxins of erysipelas and bacillus prodigiosus the initial dose being  $\frac{1}{4}$  mm injected into the pectoral region. The patient proved very susceptible to the toxins and the highest temperature at the end of one week's treatment 105.6 followed a dose of only  $1\frac{1}{2}$  mm injected into the pectoral region. He

was given five to six treatments a week, none of the injections being made into the tumor. At the end of the first week he was found to have lost 5 pounds in weight, which he regained the second week.

At the time of presentation, thirteen days after the beginning of the treatment, the tumors in the neck had decreased fully two-thirds in size, the axillary and inguinal tumors had entirely disappeared and the spleen had diminished to such an extent that it could barely be felt on careful palpation. Absolutely no other treatment of any kind was given the patient during this period. The second examination of the blood at the end of the second week showed the white cells to have increased from 4,000 to 12,000. The red cells remained the same, the polynuclear cells had increased to 82 per cent.

NOTE.—Although no microscopical examination had been made at the time the case was reported, one of the tumors of the neck was removed shortly afterward and microscopical examination made by Dr. James Ewing, professor of pathology of Cornell Medical School, showed it to be a typical Hodgkin's disease.

### EPITHELIOMA OF PALATE AND FAUCES

DR. WILLIAM A. DOWNES presented a man, 42 years old, who was admitted to the General Memorial Hospital on August 25, 1907, with the history of having had a growth in the roof of the mouth for two years. In the beginning it was situated about the middle of the hard palate. Ten months ago an operation was undertaken to remove the mass, but on account of its extent the effort was abandoned. He was treated with the X-ray from that time until his admission to the hospital.

Upon examination, the entire hard and soft palate was found to be the seat of a fungating growth which projected into the mouth from one-half to three-quarters of an inch. The right anterior pillar was involved to a limited extent. In the centre of the hard palate was an opening, which would admit the end of the thumb, this connected with the nasal fossæ, and was the result of the previous operation. There was a very foul odor, due to the necrosed bone. A few moderately enlarged glands could be made out in the submaxillary region on each side. A specimen removed before the patient was sent to the hospital showed the growth to be typical epithelioma, and although the

involvement was very extensive an operation was advised on account of the age of the patient and his very excellent condition

Operation August 26 1907 Ether was administered by means of tubes passed through the nose well down into the pharynx and the pharyngeal cavity was packed with gauze Through a curved incision the right external carotid was tied and a few small glands in the submaxillary region removed Through a similar incision made on the left side a few slightly enlarged glands were extirpated and a loop of catgut was passed around the left external carotid This loop was drawn upon gently by an assistant and held in such a manner as to control the flow of blood through the artery A median incision was then made through the upper lip and carried around either wing of the nose Each half of the lip was retracted and the nose freed from the anterior nasal process After extracting the incisor teeth the greater portion of the hard palate was removed with bone forceps—one blade in the nasal fossa and the other in the mouth The soft palate and right anterior pillar were then removed with scissors The vomer was cut away for some distance as the disease had extended considerably in that direction The growth had also invaded the alveolar processes excepting the portion adjacent to the second and third molars on the left side so it was necessary to remove the entire alveolar process on the right side and the greater part of the left This was done with the bone scissors going up on the outer wall of each antrum

The bleeding had been controlled perfectly by the temporary ligature around the carotid It became profuse however as soon as traction on the loop was discontinued and all efforts at packing the cavity were futile As only the outer wall of each antrum remained it was impossible to get the packing to remain in place nor could it be carried into the anterior part of the cavity as by doing so the nostrils became occluded After some delay it was deemed best to tie the left external carotid and this was done with the same loop of catgut that had been used to make traction on the vessel This immediately controlled the hemorrhage The speaker said he had some misgivings as to how the incision through the lip would heal after the ligation of both external carotids but barring a slight blanching for twenty four hours the wound healed as was customary for wounds in this location Healing in the lip as well as the neck was by first inten

tion The patient soon learned to swallow liquids by holding the head well back, and was discharged at the end of the second week Two weeks ago a small recurrence was noted on the portion of the alveolar process which had been left This had appeared suspicious at the time of operation, but it was left behind in the hope that it would be of use when the time came to fit an appliance to take the place, in a measure, of the missing palate and teeth Under ether, the remaining molar teeth and this portion of the alveolar process were removed The patient now felt better than he had in the past eighteen months and had gained considerable weight, although limited to fluid and soft diet While his speech was naturally much interfered with, he could easily make himself understood

#### SIMPLE FRACTURE OF THE CARPAL SCAPHOID

DR WILLIAM A DOWNES read a paper with the above title for which see page 72 In connection with his paper, Dr Downes showed a number of patients and radiographs illustrating fracture of the carpal scaphoid

DR JOSEPH A BLAKE asked Dr Downes what his experience had been in cases of fracture of this kind with dislocation of the semilunar bone and considerable displacement of the fragments Whether, under such conditions, it would be better to remove the entire row of bones, or only the semilunar and fragments? Some years ago, Dr Blake said, he showed a case of fracture of the carpal scaphoid, with dislocation of the fragments, in which an operation had been advised but refused The result of non-interference was a comparatively stiff wrist, with very little return of power For at least a year following the accident there was considerable pain on using the wrist, and limitation of motion still persisted

DR CHARLES H PECK said he recently saw a patient who about six years ago had fallen from his horse, striking on the extended hand The case was treated as a sprain, and since the time of the accident the patient had never been entirely free from pain over the carpal scaphoid, and this had interfered with his duties, which were those of a mining engineer Nothing abnormal could be felt in the wrist, but a radiograph seemed to confirm the diagnosis of old fracture of the carpal scaphoid

DR ARTHUR LYMAN FISK said that in the early part of the

summer he saw a case of fracture of the radius in which the fragments were badly united and on attempting to break the union there was a sudden snap which he believes must have been due to fracture of the scaphoid. In this instance the accident was produced by hyperextension while endeavoring to separate the lower fragment of the radius from the upper.

DR JOHN A. HARTWELL said that a small branch of the radial nerve passed over the radius in the so called anatomical snuffbox of the wrist and that pressure upon this point gave rise to considerable pain even under normal conditions. This fact had recently led him to suspect a fracture of the carpal scaphoid in a case which proved to be a simple sprain. The X ray showed that no fracture had occurred.

DR GEORGE A. WOOLSEY said that Dr. Downes' paper was important in calling attention to an injury which was now recognized much more frequently than before the introduction of the X ray. Personally he could recall but a single case when the diagnosis was made and in that instance there was a compound fracture of the scaphoid with dislocation of the semilunar.

DR DOWNES in closing the discussion said that his experience was limited to cases of simple fracture. He had seen no case in which there was either a dislocation or injury of the semilunar. In one case of that character under the care of Dr. L. A. Stimson an operation had been done for the removal of one or both fragments of the fractured scaphoid. That case had been reported by Dr. Stimson at a meeting of the Society last spring. The injury had occurred in a man who fell thirty feet fracturing his pelvis and receiving an anterior dislocation of the semilunar with fracture of the scaphoid and Dr. Stimson removed the proximal portion of the scaphoid and semilunar bones. The wrist subsequently could not be extended beyond a straight line flexion was limited to about one half and there was considerable radial shortening of the carpus. However some improvement in motion is taking place and the patient has a fairly useful hand.

Dr. Downes said the point of tenderness in the normal wrist to which Dr. Hartwell had referred had been mentioned by Codman and Chase and also by Eisendrath. In cases of fracture the tenderness was not absolutely limited to the snuffbox but often extended fairly well over towards the inner side of the radius. While the X ray was the most important aid in the recog-

tion of this form of fracture, the possible presence of crepitus should not be overlooked

### ACUTE DIVERTICULITIS OF DESCENDING COLON AND SIGMOID PERFORATION

DR CLARENCE A McWILLIAMS reported the history of a man, 47 years old, who was brought to the Presbyterian Hospital by ambulance on October 4, 1907, at 8 P M His sickness began four days previously, and prior to that he had been constipated for a week His previous history was negative Four days prior to his admission he had a chill in the morning and some cramps in the abdomen, which were not localized During the two following days he was up and about and did not have any medical attention About 4 A M of the morning of admission he was seized with an excruciating pain in the abdomen, requiring the administration of morphine, which relieved him In the afternoon he vomited for the first time He could not localize his pain but thought it was more severe on the right side His temperature on admission was 104.4, pulse, 155, and of poor quality The abdomen was much distended and rigid in all directions The patient was a very corpulent man, and no mass could be felt The abdomen was tender everywhere, but especially so in the suprapubic region and in the right iliac fossa There was flatness in the right flank, which extended downward anteriorly There was an indistinct fluid wave in the abdomen Rectal examination was negative The leucocytosis was 14,000

The diagnosis was made of general septic peritonitis due to appendicitis On opening the abdomen over the appendix by an intermuscular incision, milky fluid under great tension spurted out for a distance of two feet The intestines were flaked with large masses of fibrin, they were dull and rough, and adherent in places The pelvis was full of milky fluid, which also gushed from the liver region The appendix was brought into the wound and was found to be no more inflamed than the remainder of the intestines The appendix was removed and a small incision was then made through the middle of the upper part of the right rectus, allowing the escape of a large amount of fluid which was clearer than that in the pelvis A large quantity of fluid was also found between the liver and diaphragm The stomach was enormously dilated with fluid, its surface was normal, showing

that there was no perforated ulcer present. The pancreas and gall bladder were normal. At this time the man's condition was such that further exploratory procedures were deemed inadvisable and the wounds were hastily closed with drainage. Death occurred shortly after the operation.

*Autopsy*—On opening the abdomen the omentum was found adherent to the coils of intestine. There was a thick coating of pus over the latter, glueing them together and forming many pockets of pus. The purulent exudate extended over the entire peritoneum from the pelvis to the dome of the liver and the splenic region. The peritoneum was not much injected excepting in a few areas, the largest and most intense of which was just below the greater curvature of the stomach and to the left of the median line. There was also a considerable collection of pus in this area. The exudate had no distinct fecal odor.

The intestinal canal was apparently normal until the cecum was reached. The stump of the appendix was found to be in good condition. In the upper part of the ascending colon the saccules became of large size and this condition increased in extent throughout the transverse and descending colon. The depth was considerable and in some cases seemed to penetrate to just below the serosa. On the peritoneal surface of the descending colon about 10 cm. below the splenic flexure there was a thick layer of lymph 5 cm. in diameter in the centre of which a funnel shaped depression was seen. This communicated with a round punched out area about the size of a lead pencil in the interstitial wall situated at the apex of one of the sacculi. The number of saccules diminished in the rectum which was fairly smooth. No concretions were found in the diverticula. Cultures from the peritoneum, spleen, liver and heart blood showed pure growths of the bacillus coli.

The perforation in this case Dr. McWilliams said was not discovered in the autopsy until the intestines had been removed from the body and had been split open. It could readily be seen how impossible it would be to detect such an opening on the operating table buried as it was by fat and intestinal folds. From the adhesions in the abdomen it was fair to assume that the peritonitis had been in existence for three or four days, the perforation probably dating from the initial chill and abdominal pain. His previous history threw no light on the etiology of



the diverticulitis save a constipation of one week's duration, for the relief of which he had taken Rochelle salts

DR BLAKE said that about eight years ago he had operated on a case of diverticulitis of the large intestine, with perforation and diffuse peritonitis, which was not general. By sewing up the intestine and introducing free drainage, the patient recovered with a fistula. An attempt was subsequently made to close the fistula, but this proved unsuccessful, and when Dr Blake last saw the patient the fistula still persisted probably on account of epithelization of the tract.

# TRANSACTIONS OF THE PHILADELPHIA ACADEMY OF SURGERY

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*Stated Meeting held October 1 1907*

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## TENDON TRANSPLANTATION FOR CONGENITAL CLUB FOOT

DR RICHARD H HARTE presented a boy born in February 1901 with double congenital equino-varus. He came under the care of Dr G G Davis at the Orthopædic Hospital when 3 months of age. Dr Davis did tenotomy of the tendo-Achillis of both feet and partially corrected the deformity. The child was then sent to his home in Hazleton Pa and next applied to the Orthopædic Hospital in December 1903 when he was under the care of Dr Burton Hopkins who found such a recurrence of the deformity that he did a cuneiform tarsectomy on both feet. He resorted to this operation only after failing to maintain a good position by the use of forcible manipulations and the use of plaster casts. The patient was sent home two months later February 1904 wearing braces. He was readmitted coming under Dr Harte's care March 17 1905 with recurrence of the varus deformity in both feet. Without his braces he could not walk at all. On April 6 1905 Dr Harte did astragalectomy on the left foot combined with tenotomy of the plantar fascia and the tendo-Achillis. On May 18 1905 the same operations were repeated on the right foot. By these second bone operations it was hoped that a recurrence of the deformity would be prevented as the foot came into very good position. The patient was again sent home wearing braces. Six months later January 11 1906 he was again admitted to Dr Harte's service at the Orthopædic Hospital with recurrence of the varus deformity. Both feet were forcibly stretched the patient being etherized on January 12 1906. The plaster casts were finally removed March 15 1906 and the feet treated by

massage and overcorrection (without ether) daily for two months. New braces were applied in May, 1906, and the boy was again sent back to his home June 19, 1906, with his feet in very good position. Six months later, in January, 1907, he was again readmitted, the varus deformity having recurred to the extent shown in Fig 1. On January 16, 1907, Dr Harte did open tenotomy of all structures in the contracted soles of both feet, dividing tendons and fascia down to the bones. These wounds were left unsutured, and plaster casts applied. On February 18, 1907, both feet were stretched (ether) manually, and again put up in plaster. On March 9, and again on April 13, 1907, both feet were forcibly overcorrected by means of Hopkin's osteoclast, and Davis's tarsoclast. The feet now could easily be maintained in the overcorrected position by the pressure of one finger. On May 23, 1907, tendon transplantation was done, the tibialis anticus being separated from its attachment in each foot, and sutured to the tendon of the peroneus brevis at its insertion into the tuberosity of the fifth metatarsal bone. On July 10, seven weeks after this operation, the casts were removed, but as a matter of precaution new casts were applied for several weeks longer.

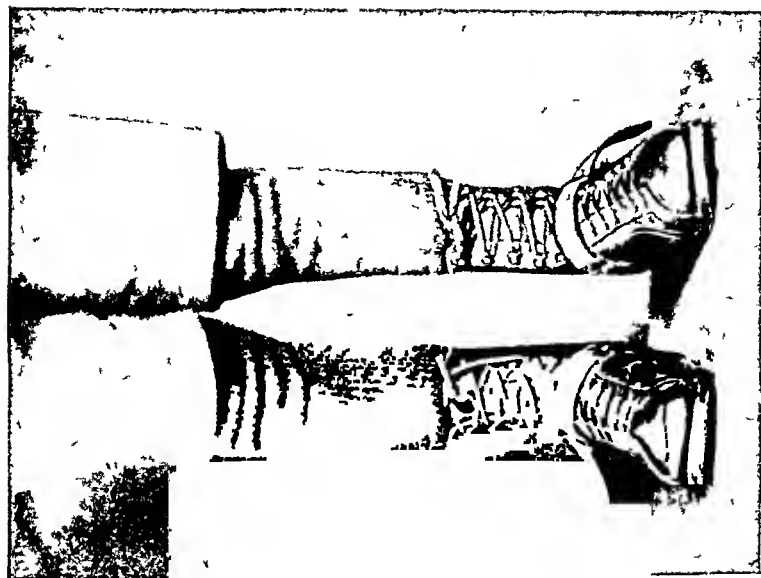
The boy now wears shoes with the sole extended and raised on the outer side, to throw the foot into a position of overcorrection (slight valgus), and with stout instep straps, to keep the heel of the foot well down in the shoe. The transplanted tendons by their action effectually prevent any tendency to the reproduction of the varus deformity, and it is hoped that at last the patient is permanently relieved of his deformity, as well as of the necessity for wearing ponderous and cumbersome braces. Figs 2 and 3 show the present appearance of the feet, as well as the style of shoes worn.

DR GWYLYM G DAVIS said that the main interest in this class of cases to him was the question of the transplantation of tendons for congenital club-foot. The transplantation of tendons for paralytic deformities is well known, but for congenital deformities it is not so much practiced. The cause of congenital deformity is unknown, the cause of paralytic deformity is of course the paralysis, and if this paralysis is not recovered from it produces an obstinate lamming which is permanent. Therefore, if one transplants an active tendon to the opposite side and judges correctly the relative amount of strength of the two sides, then



Bel t d tra pl tat g tal q o-ru ec d lp fl i frm  
t my d tragal t my

FIG 3



Shoes with soles extended and raised on outer side, also instep strap

FIG 2



After tendon transplantation, tibialis anticus transplanted to insertion of peroneus brevis

there results a balanced foot. But in a congenital case an entirely different thing is to be dealt with. There is contraction of tendons on one side and a lengthening of tendons on the other side but the muscles of the lengthened tendons do not give the reaction of degeneration. They are not paralyzed tendons therefore if one can succeed in straightening the foot and keeping it straight with massage electricity and exercise then one gradually gets a restoration of function and theoretically one should have the foot well balanced and have an apparently normal foot as a result.

In his experience every now and then a case comes up such as this boy in which even though the foot be kept in good position the lengthened muscles do not contract and regain the tonicity and strength and power of the muscles on the contracted side. Therefore in certain cases even of congenital club foot surgeons are fully justified in transplanting the tibialis anticus muscle from the inner towards the outer side of the foot and then allowing the child to get around. If as the child grows older it is found the transplanted anterior tibial and the peroneal muscles produce a preponderance of power on that side one can put the anterior tibial back again. Therefore as a sort of temporary expedient he believed in a certain few selected cases in the transplantation of tendons even for congenital deformities.

#### LUXATION OF SPINAL VERTEBRAE.—GUNSHOT WOUND OF BRAIN

DR JOSEPH M. SPELLISSY reported four cases of vertebral luxation and one of gunshot wound of the brain as follows:

CASE I—(G. B.) *Luxation of Last Thoracic Vertebra Kyphotic Deformity Slight Paralysis Recovery with Apparatus in Seven Weeks*

The injury was received March 10 1907 while working beneath a roof the supports of which gave way thus permitting the weight of the structure to come suddenly upon the patient's head and back. He was removed to the Methodist Hospital where examination discovered posterior deformity extreme tenderness and complaint of pain at the junction of the thoracic and lumbar vertebrae. Pain was also referred to the abdomen and posterior regions of both thighs. X-ray examination showed separation of the posterior margins of the vertebrae involved.

Examination by Dr James Hendrie Lloyd found slight paralysis of the lower limbs and diminished knee jerks. These conditions were still present two weeks after the injury.

The condition was treated as a case of spinal caries, with extension and counter-extension in the supine position, and with a pad beneath the kyphos for six weeks, at the end of which the patient became ambulant with a Taylor spine brace, and was discharged from the hospital at the end of the seventh week with complete recovery of the use of his lower limbs. Three and a half months after the injury he had discarded his brace and resumed his occupation. Slight posterior deformity remains, as shown in the accompanying photograph (Fig 1).

CASE II—(H M) *Rupture of the Common Spinal Ligament, Luxation of the Third Dorsal Vertebra, Laminectomy on the Fifth Day After the Injury, Delirium Tremens on the Sixth Day, Death on the Nineteenth Day*

The injury resulted from a fall of thirty feet from a scaffold, on October 14, 1906. The victim did not lose consciousness, but suffered immediate paralysis of his lower limbs, was unable to flex his fingers, and experienced through his arms and upper back pain likened to the passage of a red hot iron. He was removed to St Joseph's Hospital.

The pupils were normal, there was retention of urine and loss of knee and plantar reflexes. There was total anesthesia up to the level of the second rib, and there was slight evidence of posterior deformity in the upper thoracic vertebræ.

Surgical intervention was delayed until the fifth day after injury, at the suggestion of Dr Charles K. Mills, who saw the case in consultation.

The posterior common spinal ligament was found ruptured at what appeared to be the joint of the third and fourth dorsal vertebræ, suggesting that the cord lesion had resulted from forced spinal flexion and anterior luxation of the third dorsal vertebra (Fig 2). The lamina of the third and fourth dorsal vertebræ were removed, and the wound closed with drainage.

Following the operation, sensation descended to the level of the third sterno-costal junction. Delirium tremens appeared upon the following day, and was followed by rectal incontinence, trophic sores, and on the nineteenth day by death.

For the thorough and interesting study and for the excellent









CASE IV-A

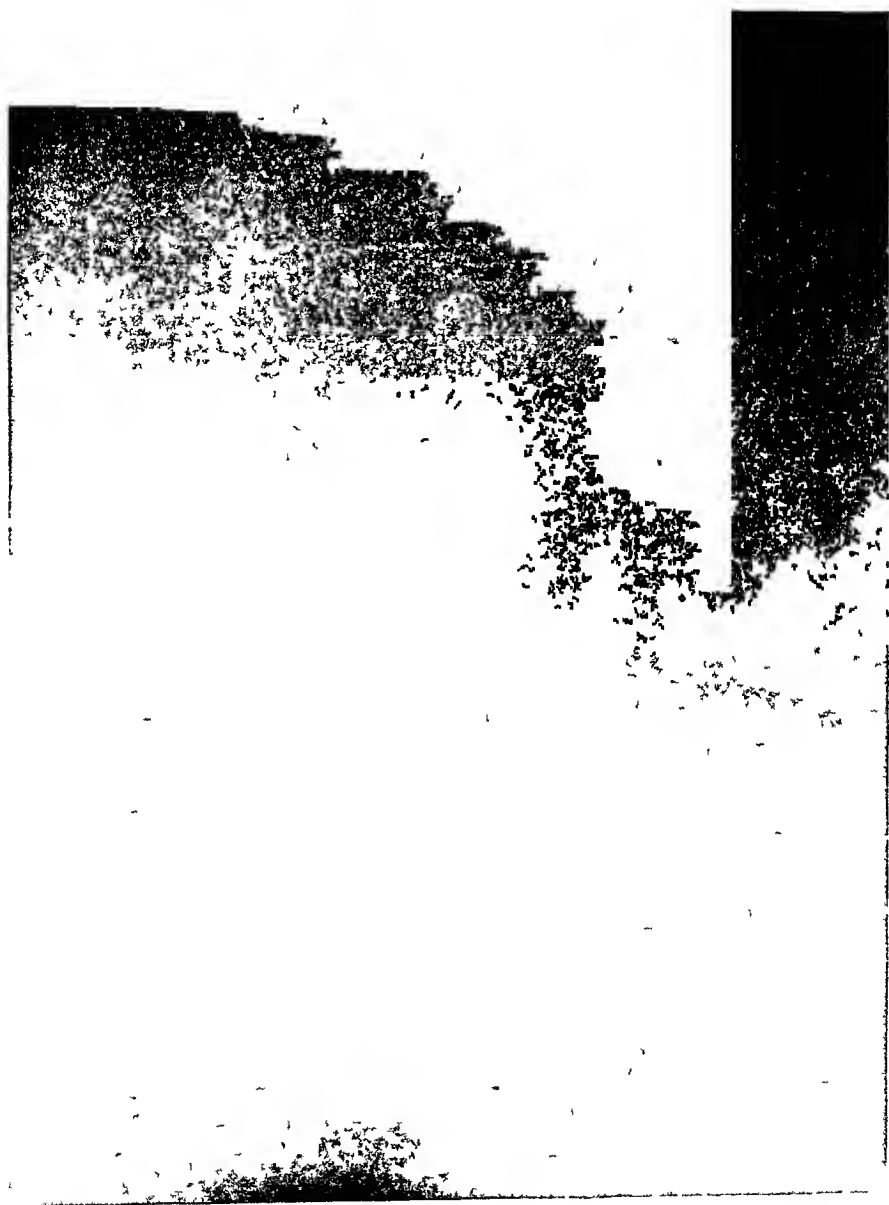


FIG 3 —Luxation of second cervical vertebra (Radiograph by F O Allen M D)

photographs of the spinal cord in this case he was indebted to Dr Alfred Reginald Allen

CASE III—(J L) *Dislocation of the Sixth Cervical Vertebra Death in Twenty Hours*

While driving a wagon rapidly under a doorway on November 1 1906 the patient's forehead struck a beam and he was bent backward and immediately paralyzed being unable to move his limbs or his left arm He had to be lifted from his driver's seat He was taken to St Joseph's Hospital

Examination showed complete motor paralysis of the lower limbs and inability to draw either hand to the head There was total anesthesia below the junction of the second rib with the sternum and in both arms posteriorly

Consultation with Dr Charles K Mills deferred surgical intervention Sixteen hours after admission the temperature had risen continuously from 94 F to 103 Twenty and one-half hours after admission it had declined to 101 the respiratory rate having advanced from 16 on admission to 36 when death took place suddenly

The character of the injury was established by autopsy but careful study of the interesting specimen was prevented by its loss Its gross examination showed rupture of the posterior common ligament stripping of the anterior ligament from the vertebral bodies posterior luxation of the sixth and upper cervical vertebrae en masse with resultant laceration of the cervical spinal cord which was nearly completely severed and the presence of free hemorrhage as evidenced by a clot between the surfaces of the partially divided cord and down the side of the cord to the level of the fifth thoracic vertebra

CASE IV—(J D) *Luxation of the Second Cervical Vertebra Patient Ambulant from Time of Injury Mechanical Cure of Traumatism Followed by Surgical Neurosis*

A crane for lifting beeves broke and fell on the patient's head in May 1906 Two days later examination in the out patient service of the Pennsylvania Hospital discovered luxation of the second cervical vertebra X ray examination corroborated the clinical opinion (Fig 3) The patient who was unwilling to remain recumbent was treated with a fixed dressing of plaster until the completion of the brace exhibited (Figs 6 7 and 8)

While the surgical condition is now cured and the brace

could be dispensed with, the patient for several months has exhibited various hysterical symptoms, including convulsions, and is now attending the nervous dispensary of the University Hospital

### GUNSHOT WOUND OF BRAIN

CASE V—(A G) *Location of Bullet in Brain by X-ray Verified at Operation Death on the Ninth Day Autopsy Discovers Bullet One-Eighth Inch from Operative Counter-Opening*

The injury was self-inflicted, terminating a debauch. The wound of entrance was at the angle of the right eye. The patient was unable to speak, though there was a little evidence of his understanding some of what was said to him. The right arm was paralyzed, and there was deviation of the tongue.

The X-ray plates printed in the illustrations were made on the admission of the patient to St. Joseph's Hospital within a couple of hours after the shooting. They confirmed the indications of injury to the left side of the brain, and located the bullet in a plane  $1\frac{5}{8}$  inches internal to the left side of the skull (Fig. 4), and  $3\frac{1}{8}$  inches below the vertex of the skull, and  $5\frac{1}{4}$  inches posterior to the frontal eminence (Fig. 5). The patient being prepared for operation, a trephine button was removed from the left side of the skull in accordance with these measurements, and a probe passed inward encountered the bullet on three different occasions. Attempted extraction by forceps proving futile, a little finger was inserted, but failed to recognize the bullet's presence. The patient was then turned over so that the operative wound was below, and an attempt was made to shake the bullet out. This was also ineffectual. The patient lived for nine days, being restless, but on no occasion having a convulsion, the temperature keeping between  $97^{\circ}$  and  $99^{\circ}$ , with the exception of one day, on which it mounted to  $101^{\circ}$ . The pulse was generally rapid and the respiratory rate was but slightly increased. The path of the bullet nearly traversed the brain. The operative wound for its removal completed the pathway, making an obtuse angle at the location of the bullet. Had the patient's head been turned with the counter-opening wound downward as soon as the latter was made, the prospects of the bullet's removal would have been increased. As it was, the bullet was sustained in the jelly-like consistency of the brain, and was easily dislocated and lost by the instrumental attempts at its removal.



CASE V

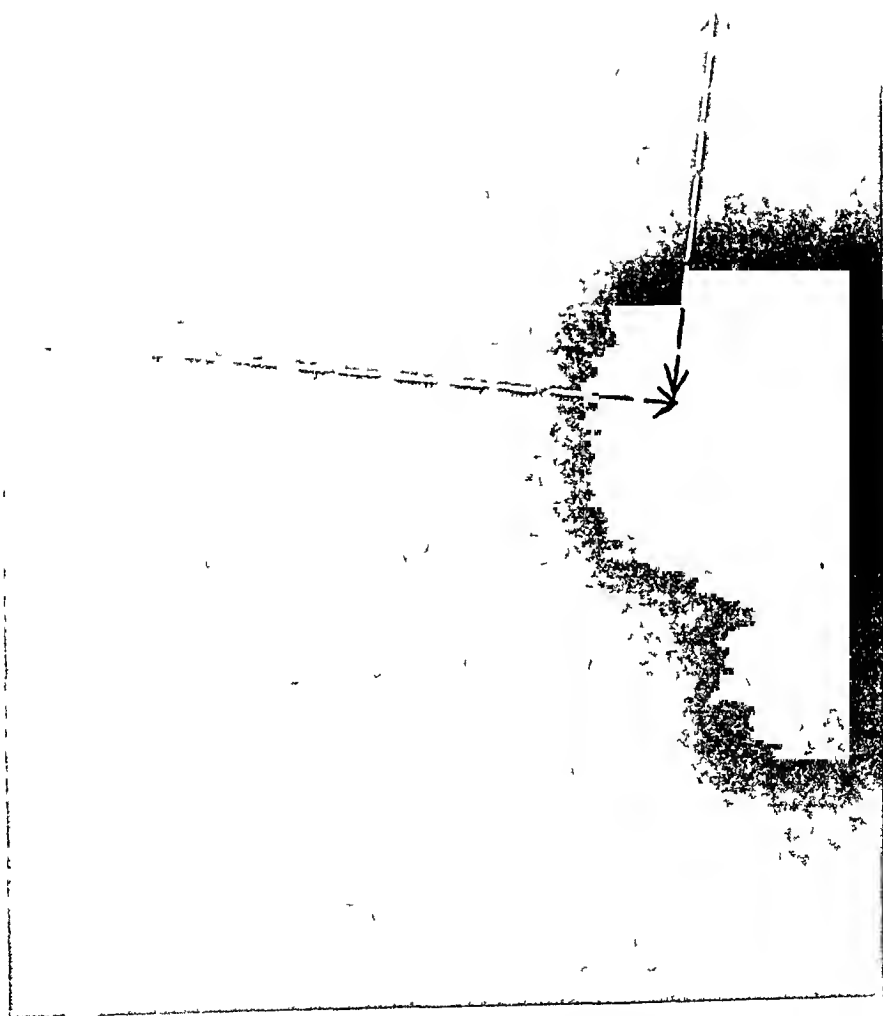


FIG 5—Bullet  $\left\{ \begin{array}{l} 5\frac{1}{4}'' \text{ posterior to frontal eminence} \\ 3\frac{1}{8}'' \text{ below the vertex} \end{array} \right.$  Radiograph by J E Roberts M D

At the suggestion of Dr Addinell Hewson the post mortem examination of the pathway of the bullet was made by vertical transverse sections of the brain from before backwards

The bullet after passing through the skull just outside the external angle of the orbit immediately above the zygoma entered the brain on the basal surface of the right frontal lobe just in front of the temporo sphenoidal lobe two inches anterior to the central fissure and one and one quarter inches from the mesial surface of the right hemisphere passing upward backward and to the left through the right lenticular nucleus the anterior segment of the internal capsule the caudate nucleus the lateral ventricle of the right side the septum lucidum and the corpus callosum on the left side and then in to the left lateral ventricle lodging at a site the plane of which was two inches posterior to the plane of the point of entrance The position of the exploratory counter opening through which the bullet was touched at operation was one inch posterior to the central fissure and one inch above the plane of the fissure of Sylvius in the lower post central convolution

At autopsy the bullet was removed from the site to which it had been dislodged in attempts at extraction It was one half inch posterior to the central fissure and one half inch above the fissure of Sylvius that is one half inch above the trephine opening one-quarter inch posterior to it and one quarter inch internal to the dura mater The original site of the bullet having been one and five eighths inches internal to the skull

Dr Spellissy remarked that in the four cases of spinal luxation the injury resulted from great weight or force being suddenly applied to the head The character of the injury was verified in the first and fourth cases by X ray examination and in the second and third by autopsy the sites of injury being in Case I the lumbar thoracic junction in Case II the third and fourth thoracic junction in Case III the sixth and seventh cervical junction and in Case IV the second and third cervical In Cases II and III there was gross injury to the cord and death followed Case II operated upon on the fifth day became complicated by delirium tremens and terminated on the nineteenth day in no way improved by the operation

Might immediate intervention have accomplished any more either for Case II or III? In Cases I and IV there was complete



recovery In Case I there were symptoms of cord injury, which disappeared with fixation and extension In Case IV, there was only pain and muscular rigidity He had successfully used the appliance employed in it in a case of cervical caries

The apparatus (Figs 6, 7 and 8) consists essentially of a pelvic band, united in front by a webbing strap From the back of the band two uprights, equally distant from the median line, follow the contour of the back, neck and head to the level of the parietal eminences, where they turn at right angles and embrace the head, terminating on a line with the external angle of the eye An occipito-mental headpiece is buckled with webbing straps fore and aft, on each side, to the horizontal arms of the uprights and affords effective extension of head and spine, when sufficient traction is made A webbing band passing round the brow and buckling to the uprights of this bifurcated jury-mast just below their horizontal turn, fixes the head and prevents lateral movement The use of webbing straps permits easier gradation of the degree of extension employed

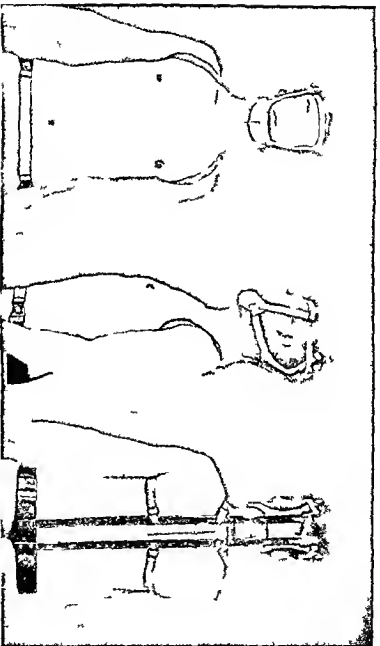
There is no doubt that some cases of cord injury can be benefited by immediate operation and that in others it is at least an unnecessary hardship if not an absolute injury But whether as a routine practice in severe cases it is the most conservative measure to at once make an inspection of brain and cord is a question that is worthy of study by trial

The report of the gunshot wound of the brain instances the accuracy of X-ray localization in these cases, a nine days survival of through and through brain injury, and the advisability of turning the counter-opening downward when probing and attempting extraction of bullets from the brain

DR ALFRED R ALLEN said that he had studied microscopically the case (Harry M ) of spinal fracture dislocation

The line of fracture was from above and posteriorly downward and anteriorly, the luxated vertebra tearing away the anterior superior lip of the body of the vertebra next below The pathological material which he received was a part of the vertebral column, comprising six vertebræ above the fracture-dislocation and two vertebræ below

A section of the spinal cord at the highest level of that particular specimen indicated from the relationship of gray and white matter that it was a thoracic segment Now if it be



FL 678 F c d ab k f 1 p c c i 11 1 21 b

CASE II

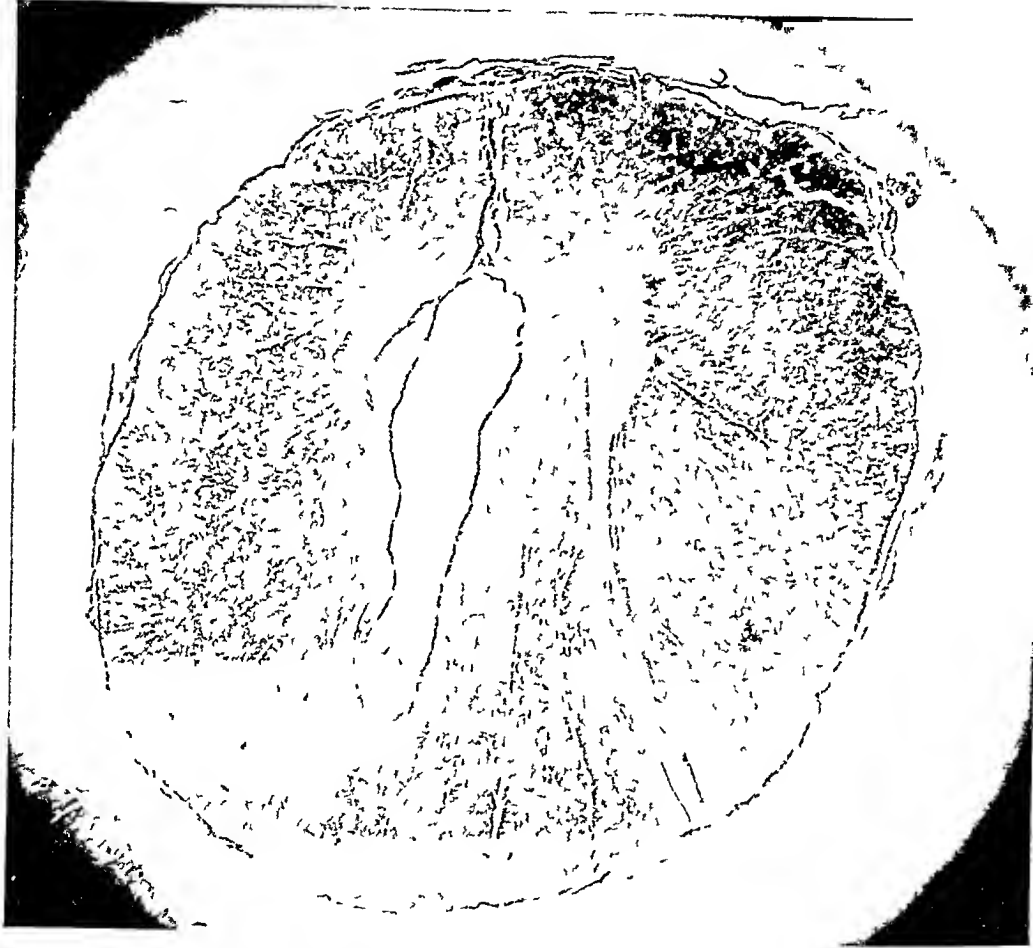


FIG 9—A section of the spinal cord in the thoracic region showing an area of softening in the gray matter, as well as an area of traumatic myelitis on each side in the anterior part of the direct cerebellar tract. Section stained by Weigert method (Photo Micrograph by A. R. Allen M.D.)

allowed by way of argument that the highest level of the specimen was the first thoracic segment—and that is the highest it could possibly be—then the fracture dislocation involved most probably the fifth and sixth thoracic vertebra crushing thereby the lower part of the seventh and upper part of the eighth thoracic segments of the spinal cord. This is a little lower than Dr Spellissy thought at the time.

There was one interesting finding in this cord—an area of central softening (Fig 9) extending from about 2 to 6 cm below the level of fracture. That central area of softening had he been able to examine every section serially would probably have revealed a damaged blood vessel possibly two or three in relation to it. Traumatic hematomyelia is due to a purely hydraulic action in one or more of the branches from the anterior spinal artery within the anterior median fissure.

The question that Dr Spellissy brought up as regards operation in these cases is one on which neurologists and surgeons will never agree until some means is discovered by which the surgeon can say with a reasonable amount of assurance. I can by this method so successfully bridge over the injured portion of the spinal cord that there will be functional continuity. That of course is a perfect impossibility as yet. In the first place there is an absence of neurilemma nuclei in the spinal cord and on these neurilemma nuclei is regeneration supposed to depend. In going over records of hundreds of cases he had been impressed by the fact that those cases which have had expectant treatment have had as high a percentage of would be cures as those operated upon.

DR RICHARD H HARTE said that the manner of dealing with these cases of spinal injury is the point which interests surgeons. A man falls from a roof or something falls on him and he is forcibly bent forward the vertebra gives way at the vulnerable point the juncture of the first lumbar and last dorsal and as a result there is in all probability a partial dislocation and a fracture possibly of the lip of the upper or lower portion of the body of the vertebra. Now the question comes up what are we going to do with these cases? As a rule they are fatal. If there is a certain amount of pressure on the cord without any destruction of the cord substance the sooner that pressure is removed the better the chances of recovery. On the other hand if there is a

certain amount of pressure on the cord, and it is not relieved, the patient being treated expectantly, the cord will in a short time degenerate, and then there is very little to be expected in the way of recovery. It seemed to him if he were in a position where he had a fracture of the spinal column and had to decide the question whether he would rather lie on a water bed for a time and then die as the result of bedsores, cystitis, etc., or have his neural canal opened and dealt with, he should certainly take the chances and have his canal opened. He thought that on the whole, if one gets one per cent of recoveries one is fortunate.

He recalled one case where he did an operation for this condition. The man had a fracture of the lower portion of his spinal column and he is now putting up gutters and tin roofs through the country!

He had opened many canals with indifferent results, but on the whole he thought this procedure offers to the majority of cases the best chance of recovery. He could not see, in these cases, what was to be gained by treating them expectantly. By waiting a degeneration of the cord is likely to occur, and when that occurs, as the result of pressure, little can be later accomplished by going into the neural canal. He had tried both ways, and while the results are not brilliant in either, he had obtained better results by promptly relieving the pressure.

DR ALFRED R. ALLEN said that it was doubtful whether in fracture-dislocation of the spinal column, the degeneration of the cord which is found in cases which have lived some time after the accident, is due to unrelieved pressure. He mentioned a case of gunshot wound where the bullet impinged instantaneously on the dura, not enough to even ruffle the surface. A laminectomy revealed the cord apparently normal. The case died, and the cord at autopsy was found to be just like jelly for at least three centimeters. In this case there was a pressure which had been brought to bear and then instantly removed, and yet there was complete degeneration.

#### PUNCTURED FRACTURE OF THE SKULL

DR GEORGE G. ROSS read a paper with the above title, for which see page 108.

DR ADDINELL HEWSON said that in view of the statement made by Dr. Ross that the cerebral abscess is often not recognized,

he would report a case which in the last few days came under his observation. A man died in one of the hospitals in Philadelphia from pulmonary tuberculosis with intestinal involvement. The body was unclaimed and came to the Anatomical Board and was distributed to one of the colleges. After the injection of the body the brain was removed and there was found a nail nearly  $2\frac{1}{2}$  inches in length which had perforated the sagittal suture near the bregma and an abscess was found about this nail probably holding as much as an egg. He questioned the resident of the hospital—he did not even know that there was any wound about the man's head. The nail did not penetrate the brain; it was between the longitudinal sinus and the brain substance involving the dura and the arachnoid.

He mentioned this case here as one where there were no symptoms of any kind and the resident who attended the man for six months knew nothing whatever about this condition.

DR G. G. DAVIS said that he had seen a couple of cases of these punctured wounds. One a man who received a punctured wound of the orbit by a metal hook which penetrated the brain going upwards and backwards. The point of the hook struck the dura in the upper posterior portion of the vault of the skull. This case occurred while he was a resident at the Pennsylvania Hospital. The man died from septic cerebritis. A second case was under his care some fourteen years ago for the first time. The patient, a young man, was riding on a bicycle and was struck by a wagon and something penetrated his eye. The left eye was lacerated and the wound entered through the top of the orbit and went some distance into the brain. The eye was removed as well as some pieces of glass and for several days thereafter there was quite an amount of brain matter discharged. He introduced a drainage tube and simply washed the part out with boracic solution. That young man recovered and he heard nothing from him until within a few months ago when he came back with the report that he had attacks which he took to be epileptic which were preceded by a very offensive subjective odor and he likewise complained of a headache. For this he was placed on bromides and he has had no attacks since although he only takes ten grains of bromide of sodium once a day. This is an example of the fact that if the brain is injured very markedly and if recovery ensues the patient later shows some nervous trouble.

## HERNIA CEREBRI

DR MACY BROOKS reported a case of recovery from hernia cerebri involving the frontal lobe, resulting from extensive fracture, as follows. A boy of 11 years, rather low order of intellect, was kicked in the head by a horse.

When first seen there was a large gaping wound over the left brow from which blood and brain matter were oozing.

An incision was made from the glabella, inclining upwards towards the upper temporal region, exposing a compound comminuted fracture. Fragments of bone were removed which included the crista galli and a large portion of the frontal bone of that side, this exposed an opening in the dura three-fourths of an inch in diameter, the dura had been punched out over this opening and driven into the gray matter. Upon probing this cavity with the little finger he felt something hard in the brain substance about an inch in from the cortex, parallel with the base of the brain. Upon introducing a pair of forceps he extracted a fragment of bone and a matted lock of hair. The boy being very dirty, the accident having happened in a stable, and there being extensive laceration of brain matter, he did not close the opening in the membranes with a pericranial flap. After removing all loose fragments of bone and trimming up the edges, the wound was well irrigated with hot saline solution, a strip of iodoform gauze was introduced and the wound dressed with gauze and a firm bandage.

The patient was not unconscious at any time. He recovered nicely from the operation. On the third day the gauze was removed from the cavity. Its removal was followed by a flow of a considerable quantity of disorganized brain matter. A small drain was reintroduced, this was removed in twenty-four hours. By this time the brain had started to protrude. There was a hernia about the size of a pigeon egg. This upon the advice of Dr W J Taylor was dressed with a ring of gauze to avoid pressure and dry gauze over the ring. The skin edges were touched at each dressing with silver stick and as the skin grew in around the hernia, the protruding gray matter was gradually cut off until the opening was entirely closed. Apparently the boy's mental condition has not changed in any way since the accident. The wound healed in forty-eight days.

DR. G. G. DAVIS said that this case is simply another which shows that it is apparently unnecessary to operate for the cure of hernia cerebri and in substantiation of that position he mentioned a case somewhat similar to this in which he saw a hernia cerebri on the vault of a skull from a fracture in which the protrusion of the brain was approximately  $1\frac{1}{2}$  inches long and oval in shape Gauze was placed around it very much as in Dr. Brooks case only it was wet with alcohol. He thought that the alcohol tends to tan and shrivel and dessicate the hernia cerebri. In a few weeks contraction took place and the skin covered it. Unfortunately the child which was quite young was said later to be completely blind. In the majority of these cases some decrease in the mentality of the patient is later to be expected.

DR. JOHN H. GIBBON called attention to the portion of bone which had been driven in. This recalled to his mind a case he had assisted Dr. Keen operate upon. The patient was a soldier who had been shot in Cuba. He was trephined shortly after his injury. He then developed epileptic attacks and was operated upon again in Cuba. He then came back to this country, was admitted to one of the large hospitals and operated upon again, an osteoplastic flap being turned back. He was then sent home as apparently incurable. He continued to have his attacks and got into pretty wretched condition. He applied for admission to the Jefferson Hospital and through certain influences although it was thought there was little to be done for him, he came down to be examined. It seemed that there was some pressure which might be relieved. Dr. Keen operated upon him and about an inch and a half below the brain surface near the median line in the parietal region he found a piece of bone as large as the first joint of the thumb with about an ounce of pus around it. The patient had been trephined three times, once immediately after the injury and twice subsequently without this bone being discovered. The necessity for exploring the brain thoroughly where there is a comminution of the skull is most important.

DR. RICHARD H. HARTE said that Dr. Gibbons remarks recalled to his mind a case at the Pennsylvania Hospital where a boy was injured being hit over the brow with a brick resulting in a large scalp wound. There was also a distinct transverse linear fracture with slight depression in one spot but without any symptoms. The tendency in many cases would have been



to let it take its course, but for some reason or other he felt suspicious about it. He therefore explored it and found some gritty substance, raised up part of the anterior lobe and worked back into the anterior fossa, and took out about a teaspoonful of plaster. The boy was evidently struck with a brick which had plaster on it, and this plaster had been scraped from the brick by the receding skull and deposited in the cranial cavity.

This only goes to prove that many times a fracture may be carefully explored and nothing found, while at other times something is found, and he therefore agreed with Dr. Gibbon that it is best to make a thorough exploration of these cavities.

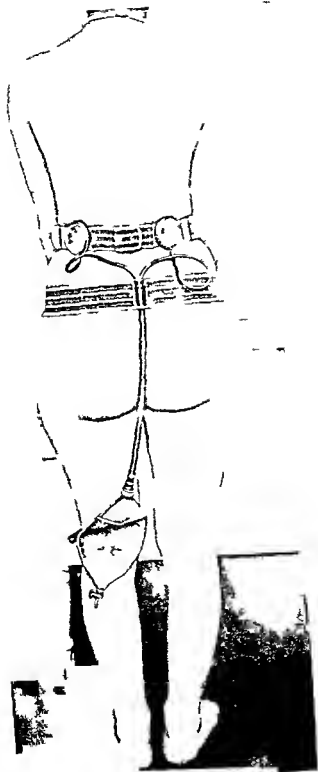
#### PERMANENT DRAINAGE OF BOTH KIDNEYS THROUGH LUMBAR OPENING

DR. HIRAM R. LOUX described a case of permanent drainage of both kidneys, and exhibited the apparatus used for the collection of the urine.

DR. JOHN B. ROBERTS asked whether this apparatus would answer satisfactorily in cases of tuberculosis, extirpation of the bladder, or other conditions of the bladder where some such measure is necessary?

DR. HIRAM R. LOUX said that the apparatus shown would answer very well for tuberculosis, especially where the condition of the bladder was such that it made the patient a great sufferer. In extirpation of the bladder it would hardly do, unless the ureters were removed at the same time.

This patient was instructed about the care of this apparatus, and she boils the catheters fifteen minutes and takes the utmost care with the urinal so that there is no odor attached to its use.





## BOOK REVIEWS

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**HUMAN ANATOMY INCLUDING STRUCTURE AND DEVELOPMENT AND PRACTICAL CONSIDERATIONS** By THOMAS DWIGHT M D LL D Professor of Anatomy in Harvard University J PLAYFAIR McMURRICH M D Ph D Professor of Anatomy in the University of Michigan CARLA HAMANN M D Professor of Anatomy in the Western Reserve University GEORGE E PIERSOL M D Professor of Anatomy in the University of Pennsylvania and J WILLIAM WHITE M D LL D Professor of Surgery in the University of Pennsylvania With 1734 illustrations of which 1522 are original and largely from dissections by JOHN C HEISLER Professor of Anatomy in the Medico Chirurgical College Philadelphia Edited by GEORGE A PIERSOL J B Lippincott Company Philadelphia and London 1907

To the students of anatomy this new treatise edited by George A Piersol Professor of Anatomy in the University of Pennsylvania will be welcome The works of Gray and Morris and Quain have for many years been preeminent but it is probable that this new treatise which is the most complete that has yet appeared in the English language will replace these other works especially in the medical schools throughout the United States The book presents the essential facts of human anatomy regarded in its broadest sense and is most extensively illustrated in such a way as to elucidate very clearly the subject matter Dr Thomas Dwight has written the description of the skeleton including the joints of the gastro pulmonary system and of the accessory organs of nutrition Dr Carl A Hamann has written the section on the cerebro spinal and sympathetic nerves Dr J Playfair McMurrich who is without question one of the foremost anatomists of this country describes the muscular the blood and the lymph vascular systems No one who has studied under Professor McMurrich could doubt his ability to present this subject most thoroughly system conciseness accuracy characterize his descriptions The illustrations of this part of

the book are exceptionally good and are well-chosen. The relation of the bones to the muscular system has been well worked out. Most of the recent text books describe the bones without showing graphically the points of attachment of the muscles to the bones, but to the student the conformation of a bone means nothing unless there is associated with it something attached to it or in relation to it, this point has been appreciated by the authors and in all of the illustrations of the bones, the points of attachments of the muscles to them have been outlined in red. It would have been better still had the name of the muscle been printed upon the area of attachment of the muscle, instead of using a line with the name printed in the margin. The vascular system is carefully described, and its embryology, histology and the composition and development of the blood constituents are all faithfully detailed. Considerable space is given to a description of the heart, and the practical anatomical considerations concerning it. Dr Piersol has written the introductory, histological and embryological paragraphs throughout the work, and has contributed the descriptions of the central nervous system and the deep relations of the cranial nerves, especially the uro-genital system. It is needless to say that his work has been thoroughly done.

As surgical work has advanced, so have the demands for more accurate knowledge and teaching in the relation of the organs and tissues of the body to each other, and a more adequate consideration of the practical applications of anatomy, that is, the association of anatomical facts with those conditions resulting from injury and disease. Dr J. William White has undertaken this department of the work, and his experience as a surgeon and as a teacher of surgery has enabled him to do it most thoroughly, he shows the practical relationship between surgery and anatomy. This feature occupies quite a distinct place in the book and adds greatly to its value. The field of operative surgery is in no way covered, although brief descriptions of operative methods have been given in some instances, and it shows the student the importance of a thorough understanding of anatomy before the surgical treatment of any condition can be undertaken. The many new and exact illustrations are important features of the book. Some of the anatomical text books which have been published in recent years have borrowed

their illustrations from other books and in so doing have lost their originality and therefore their value. The present publication is by far the best work on Human Anatomy by American authors that has yet appeared.

PAUL PILCHER

**SURGICAL DIAGNOSIS** By DANIEL N. EISENDRATH M.D. Adjunct Professor of Surgery in the Medical Department of the University of Illinois (College of Physicians and Surgeons). Octavo of 775 pages with 48 original illustrations, 15 in colors. Philadelphia and London: W. B. Saunders Company, 1907.

Dr. Eisendrath has set for himself a most difficult task. As Killam has said: "There can be only one diagnosis, i.e. the true scientific diagnosis in medicine. Surgery has to do only with the treatment. It is the conditions then that demand surgical treatment which must be included in any work on surgical diagnosis." Another reviewer of this volume has asked the question:

"Why did Eisendrath write this book?" There is hardly any branch of the science of medicine which needs more light thrown upon it, more study devoted to it than this subject of surgical diagnosis which has been most shamefully neglected in the writings of authors. Foreign surgeons have produced one or two small treatises on this subject but they have been most childish in their incompleteness.

Dr. Eisendrath has chosen to treat the subject of surgical diagnosis chiefly from the clinical standpoint—that means that he has omitted almost entirely the pathological side of the question which is daily gaining more and more importance in the establishment of any diagnosis. In discussing each disease it would seem to the reviewer that the symptoms, complications and sequelæ have not been carefully and clearly enough dwelt upon to render the recognition of the disease unmistakable. Oftentimes the differential diagnosis is more fully considered without enough care being taken in describing the direct diagnosis.

There are eight chapters in all. The first chapter considers the surgical affections of the head; the various injuries and diseases of the scalp, skull and brains are considered together and from the clinical aspect this is a very logical arrangement. This section of chapter I is by far the most interesting and thor-

ough, the descriptions are clear and the points in differential diagnosis are well contrasted. The illustrations are excellent, and there are a number of tables which allow of a rapid review and comparison of surgical conditions whose symptoms closely simulate each other. The intra-cranial complications of middle ear and mastoid suppuration are considered, but why the surgical diseases of the middle ear and mastoid should be omitted is not clearly understood.

Chapter II takes up the surgical affections of the neck. It would seem that here the author many times tends to leave out the ordinary subjective symptoms which the patient feels, and does not dwell sufficiently long upon the previous history of the patient, seldom speaking of the course of the disease and the changes which may take place from time to time as the disease progresses. The thorax, abdomen, extremities and spine are taken up in detail.

Chapter VII is devoted to post-operative complications, the last chapter, to methods of examination. The section upon cystoscopy and ureteral catheterism was written by Dr Gustav Kolischer. The illustrations of cystoscopes show the types of cystoscopes in use twenty years ago by Brunner and Nitze, these instruments have long since become obsolete, more useful ones having been invented by American surgeons. The book is very well written, is well illustrated, and is by far the best work that has yet appeared on the subject of surgical diagnosis.

PAUL M. PILCHER

**MANUAL OF OPERATIVE SURGERY** By JOHN FAIRBAIRN BINNIE, A M., C M (Aberdeen), Professor of Surgery Kansas State University, Kansas City Philadelphia P Blakiston's Son & Co 1907. The first edition of this book was thoroughly reviewed in Vol XLII, 1905, of the ANNALS OF SURGERY. Within two years two editions have been exhausted the present being the third revised edition.

The Manual is unique in the field of operative surgery, the name which has been given to it, describes it. It is rare that a surgeon writing such a book can resist the temptation of giving the etiology, the symptomatology and often his personal preferences in the treatment of surgical affections, but this has been accomplished in the present work. A description of the opera-

tions on the female pelvic organs on the arteries on bones and on joints are omitted Each chapter takes up a certain surgical condition and the most practical operations for the relief of that condition are given All antiquated methods are omitted The descriptions are clear short and well illustrated in many places illustrations take the place of lengthy descriptions Some chapters close with well chosen remarks by the author containing his own preferences and advice resulting from his own experience The book is a very serviceable one and is designed for practical use by the surgeon

PAUL M. PILCHER

**THE TECHNIC OF MODERN OPERATIONS FOR HERNIA.** By ALEXANDER HUGH FERGUSON M.B. C.M. F.T.M.S. Professor of Clinical Surgery Medical Department of the University of Illinois Professor of Surgery at the Chicago Post Graduate Medical School Chicago Ill. Illustrated by reproductions of original drawings from the author's collection Chicago Cleveland Press 1907

The text of Ferguson's book is divided into two parts Part I giving the general considerations classification indications for operation aseptic and surgical technique complications of hernia and the results of operations for hernia Part II is devoted entirely to operations for the cure of hernia

The work presents only the surgical phase of the subject while omitting discussions of etiology symptoms and diagnosis some space is given to the causes leading up to and predisposing to hernia The author has had a wide experience in the treatment of hernia and naturally preference is given to the expression of his own ideas concerning the proper methods of preparing for and operating upon hernia At the same time he quotes freely from the literature and faithfully describes the operations of other men The illustrations are clear and good but are not well distributed throughout the book seldom appearing opposite the text which they illustrate The author goes into detail in treating of the various suture materials the methods of preparing the patient and makes throughout many pertinent remarks relative to the personal equation on the part of the surgeon He prefers antiseptic to aseptic catgut His methods of preparing the patient for operation are very good and show that he considers simplicity



and routine in these matters of importance. He insists upon the surgeon changing all clothing before the operation, and would prohibit talking by the surgeon while operating, two points in operative technique which most men do not observe. He recommends that the appendix be always brought out and inspected through a hernia wound, and also recommends that, if desirable, a thorough examination of the pelvic and abdominal cavities may be made through the wound which is to be enlarged if necessary. In speaking of the necessity of operating upon inguinal hernia when present, he writes as follows:

"All hernias of the inguinal variety in both sexes between two and forty years of age, should be cured by operation if circumstances and physical condition permit of it. No young man or woman is doing justice to his or her development and health by nursing a rupture during school or college life, let alone the many risks incidentally encountered on play-ground and campus."

The mortality following hernia operations he gives as less than one-quarter of one per cent. In illustrating Kochei's operation for inguinal hernia, he gives the lateral transposition method, while Kochei now uses the transposition method by invagination, where feasible, which he considers a marked advance in the technique of his operation. He accepts the advice of Bloodgood in opening the sheath of the rectus muscle and suturing the muscle to Poupart's ligament, where the conjoined tendon is not sufficiently strong to be used. The advisability of this would be questioned by some surgeons. The monograph is one of the best and most thorough treatises that has yet appeared on the surgical aspect of hernia.

PAUL M. PILCHER

**MANUAL OF SURGERY**. By ALEXIS THOMPSON, F.R.C.S., Assistant Surgeon Edinburgh Royal Infirmary, and Alexander Miles, F.R.C.S., Assistant Surgeon Edinburgh Royal Infirmary. Two volumes. Second edition revised and enlarged. Pentland, Edinburgh and London. 1906.

Volume I is a treatise on General Surgery, and although small, still contains 770 pages of reading matter. Such a treatise can not be considered a hand-book, and is a systematic view of the present-day aspect of surgery, meaning to be useful to the practitioner and at the same time available as a text-book and manual.

for students this in fact is its main purpose. Pathology has been somewhat slighted and is only given in connection with diagnosis and treatment.

Volume II deals with Regional Surgery. In many places the surgical anatomy of the part is given before injuries and diseases of the part are considered. Also special methods of examination are carefully described. The work has been prepared with care and as a manual for the student of medicine would be useful but as a book for the practicing surgeon is lacking in many essentials.

PAUL M. PILCHER

DISEASES OF THE RECTUM AND ANUS. By HARRISON CRIEFS  
F.R.C.S. Third edition. 1907. J & A Churchill London  
and W. T. Keener & Co. Chicago.

This book commends itself to the profession as a full and exhaustive treatise upon the department of rectal surgery and well maintains its position as a valuable standard authority.

It presents at the outset a series of plates of microscopical specimens of normal tissue and morbid growths as valuable if not more so than any to be found in kindred works. The initial chapters on Anatomy and examinations and Diagnosis are highly instructive and the latter abounds in suggestions alike valuable to the general practitioner and the specialist.

The author's position as to the use or rather uselessness of rectal specula except under anæsthesia and his emphatic declaration that "The idea of using one on the consulting room couch should be abandoned" may seem startling to many who do use them and value them highly but it must be confessed his strictures in the main are sound whether his like criticism of the use of the recto scope is as warranted may be questioned.

In his consideration and treatment of malformations of the rectum a most interesting series of cases is given showing the results of operations in imperforate rectum and anus in one hundred cases with a mortality of fifty per cent. In the chapter devoted to hemorrhoids we find a careful delineation of the different varieties with considerable space devoted to etiology, methods of examination, diagnosis and illustrative cases. The author's suggestions for the treatment of inflamed and strangu-

lated tumors seem highly commendable, especially the one that indicates this condition as a favorable time to induce the sufferer to submit to operation for radical cure

It is true that many will go through life suffering from this painful and enervating disorder, and never at any other time entertain the idea of an operation

In the classification of methods for radical cure, the author differs but little from the position taken by most standard authorities. Crushing, and the method of puncture by hot needles, he passes with slight notice. The application of strong nitric acid is considered advisable mainly when the trouble consists of hæmorrhages from superficial vascular areas. Against the method of injections of carbolic solutions, he evidently shares the sentiments so long pervading the leading authorities.

In this he differs materially from the position favorable to this method taken by Professor Tuttle in his recent work (1903), *An attitude, we believe, borne out by the experience of many other specialists*. The author, however, admits that "in certain selected cases, with the proviso that the patient shall be perfectly at rest for two or three days following the injection, the plan may have a sphere of usefulness". From a large experience with this method the writer would be inclined to dissent from the necessity of imposing this restriction upon the majority of cases. In some it may be important, but if the solution is of moderate strength and the quantity injected not too large for the size of the tumor, the patient, as a rule, will suffer no inconvenience from moderate exercise. The object of this treatment being, as it is so admirably indicated by Professor Tuttle, "The production of an inflammatory induration of the hæmorrhoidal mass," but which falls short of complete strangulation and sloughing.

In speaking of the Whitehead operation, while conceding that in the hands of the originator and others it had proved a valuable remedy, yet he makes the following significant statement, which from one of wide experience, demands consideration. "I have, during the last ten years, seen no inconsiderable amount of anal stricture resulting from this operation."

It is clear, that after according all due credit to other operative methods, the author's preference is given to treatment by ligature with which he combines the free use of the scissors in a method similar to that adopted by Allingham. His preparation

of patients operative technique after dressing and care in cases of secondary hæmorrhage leave little to be desired

For the cure of prolapse of the rectum the author favors the use of nitric acid in mild cases and the actual cautery in graver ones in preference to excision. The writer has in several cases had excellent results by combining the two methods as follows. Excision of triangular strips of membrane from the protruding mass followed by cauterization (actual cautery) of the denuded surfaces the result being in each instance satisfactory and permanent

In the chapter on rectal abscess and fistula in ano the delineation of anatomical relations pathological processes complications and methods of operation are very full and complete but contain little differing from that to be found in other standard authorities

In the treatment for the cure of anal fissure the author recommends dilatation combined with the use of the knife as against dilatation alone making he says a cut at least an inch in length and one third of an inch in depth and the reason for this preference is that dilatation alone sometimes fails. In the subsequent paragraph he admits that failure also follows the above operation. This position in favor of the knife as against division is maintained by Helsey for a different reason i.e. that it can be used without general anesthesia with cocaine. Neither of these reasons seems to the writer to justify this preference. Unless the incision is deep enough to set the muscle effectually at rest it is also liable to failure and as an operation it is far more formidable to the patient involving far more pain inconvenience and detention from business. It may be fairly asked what is there against division to justify the surgeon in submitting his patient to this greater sacrifice? What is the aggregate percentage of failures? Dolbeau of Paris so strongly favors dilatation that he scarcely admits the justification of any other method. Vanburen and Allingham used it extensively. Matthews says emphatically all cases of fissure of the anus with the rarest exceptions are curable by division of the sphincter muscles. He makes a marked distinction which the author does not seem to do between fissure and the rounded irritable ulcer often found higher in the bowel for which he reserves the use of the knife. The writer's experience in a little over seven hundred cases treated by division was prompt healing and disappearance of

all symptoms in ninety-three per cent (non-malignant) In the chapter on Stricture of the Rectum, we find a very careful and accurate delineation of this troublesome disorder and its complications The author lays special stress upon the importance of early and faithful efforts at gradual dilatation, when much can be accomplished in the way of cure which later may be impossible His wise caution against the injudicious use of forcible dilators and deep internal incisions without proper drainage, commends itself to every conservative mind, and his declaration that "posterior lines proctectomy, with complete division of the external parts," is one of the most valuable methods that surgery offers for the relief of rectal stricture will meet with general approval The same may be said of colotomy, which he commends as the remedy best available for the undilatable tubular strictures, which are located too high for safe incision Perhaps the section of this work, which will deservedly receive the widest attention, is the several chapters devoted to cancer of the rectum, including the Jacksonian prize essay on Cancer This voluminous section constitutes without doubt one of the most thorough and exhaustive treatises to be found upon this subject in any kindred work

Etiology, Questions of Inheritance, Tendencies to Recurrence, Methods of Extinction, are all most fully canvassed, but the main interest centres in the chapters devoted to operative procedures for the relief and cure of this grave disorder

When we consider that but thirty years ago excision of rectal cancer was mentioned in the leading text books, only to be condemned, the achievements indicated in this and other recent works show the marked advance in rectal surgery as keeping full pace with all other departments The author's distinctions between cases, where excision is justifiable and those that seem hopeless shows a wise conservatism He gives a series of tables showing results in a large number of cases that are highly instructive and interesting, and should go far toward removing any remnant of doubt from the professional mind as to the justification of this operation

Table E is of special interest, showing the mortality from excision in 85 cases, with the subsequent history of those that recovered Of the 85 cases only 4 died, while 81 survived Of those recovering, in 33 the disease recurred, while 32 remained well and apparently cured for a period of three years When

we remember the fatal nature of the unchecked malady the above sum shows most encouraging results

The table showing the results of the author's private operations in colotomy is also of interest as indicating this as a valuable means of palliation and prolongation of life in cases where excision is clearly inadmissible

J RUSSELL TABER.

**EYE INJURIES AND THEIR TREATMENT** By A MAITLAND RAMSAY M D James Maclehose & Sons Glasgow and The Macmillan Company New York 1907

This book as the author indicates in the preface is simply a series of lectures on Eye Injuries and Their Treatment collated and edited in such manner as to make them presentable in book form for the use of the general practitioner

The clear concise and graceful style of Dr Ramsay is well illustrated in this volume and the eleven chapters comprising it make interesting and instructive reading for the specialist and general practitioner as well though it should be borne in mind that the book is not and was not intended by the author to be a standard work on the subject

In the series of lectures here presented the author enters not at all into abstruse theory as to the care and treatment of eye injuries but confines himself rather to the domain of reasonable conservatism and of broad personal clinical experience thereby appealing especially to the general practitioner who per chance may be called upon to treat injuries to the eye without having the opportunity of recourse to the specialist

Notably chapters IV V VI VII IX X and XI are to be commended for the scholarly and lucid manner in which the author presents their subjects and the chapter on serpiginous ulcer of the corner is a classical thesis in itself

Penetrating wounds and retention of foreign bodies in the eye ball are ably and fully described and their management advocated in accordance with the most modern methods

The Sideroscope Magnet and apparatus and the method of localizing intra-ocular foreign bodies are described in a practical way

The chapter on sympathetic ophthalmia is excellent and while it adds nothing new to our knowledge as to its causation

the ground is thoroughly covered. The indications and contra-indications for enucleation in this unfortunate malady, often so perplexing to the ophthalmologist, are discussed in a convincing manner, and the rules governing it which he formulates at the conclusion of this chapter are logical and definite.

Under ocular therapeutics, the author reviews about all of the newer remedies of value, including serum therapy and many of the older ones as well. Subconjunctival injections, heat, cold and counter-irritants receive their share of attention, and under this latter heading it is interesting, even astounding, to note that the *seton*, applied at the nape of the neck or temple, is recommended for certain kinds of ocular inflammations. *This will not* receive the endorsement of American Ophthalmologists.

Chapter XI, the last, concludes with "General Directions Regarding Operations on the Eye and, in the preliminary, operative and post-operative care of his patients, Dr Ramsay advocates the employment of anti- and aseptic methods in so far as they are compatible with ophthalmic practice.

There are 25 plates, in colors and in black and white, all of which are excellent.

The rest of the book, 50 pages, is made up of formulæ in use at the Glasgow Ophthalmic Institute. The work is printed in large clear type on heavy durable paper, and as a whole does great credit to the author, and he may well be proud of it.

J SCOTT WOOD

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# ANNALS OF SURGERY

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## ORIGINAL MEMOIRS

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### LUDWIG'S ANGINA

AN ANATOMICAL, CLINICAL AND STATISTICAL STUDY

BY T. TURNER THOMAS, M.D.

OF PHILADELPHIA

Instructor in Surgery, University of Pennsylvania; Assistant Surgeon  
to the University of the Philadelphia General Hospital.

LUDWIG in 1836 described a condition which he considered a morbid entity and which since that time has been designated more or less universally as Angina Ludovici. Various attempts have been made to establish it upon a definite pathological basis but the results of none of these can be said to have been generally accepted. That it is an infection there can be no doubt but the character of the infection if it has a special character has never been decided. That it is more rapidly fatal than similar infections occurring in other parts of the neck than the submaxillary region is amply proved by the recorded cases but why or how it acquires so dangerous a character has never been clearly demonstrated. It is well known that certain cases assume a grave aspect and threaten or take the life of the patient in twelve to twenty-four hours while others begin and continue as a comparatively mild affection for days and then suddenly assume an alarming character. That its general course and symp-

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Read before the Philadelphia Academy of Surgery November 4  
1907



toms are typical and essentially constant is convincingly shown by the numerous cases that have been reported. Yet many have been and some are still being reported, which should not be designated by this term. The following case led the writer to make a study of the subject.

W W, male, age 32 years, machinist, admitted to drunk ward of the Philadelphia Hospital, August 10, 1903. On admission the temperature was 98, pulse 110, respiration 30. Has been drinking for about a month. Is nervous and has marked tremors of the hands and tongue. He cannot eat or sleep. The heart is rapid but the sounds are good, and there are no murmurs. He has no hallucinations, and is well nourished. He complains of a small, painful swelling under the right side of the lower jaw which has been there for about a week. On August 13 he was transferred to the surgical ward, in the service of Dr A C Wood, to whom the writer is indebted for the privilege of reporting the case. Temperature 98.2, pulse 78, respiration 22. The swelling is increasing in size. The pain keeps him awake at night and prevents him from taking his nourishment. Incision made in the submaxillary region, the index finger being introduced its entire length without evacuating any pus. August 14th swelling is increasing rapidly, is hard, non-fluctuating, and involves the whole under side of the jaw. Speech is difficult, and he is having such difficulty in swallowing that he is being fed with a spoon. Temperature 101, pulse 100, respiration 26. General condition otherwise good. August 15, at 8 P M, he was cyanotic and respiration was very difficult. Tongue swollen. Oxygen inhalations given for a time with some relief. Then he became rapidly worse. Pulse intermittent, rapid and weak. At 10 P M tracheotomy was performed by the resident in charge, Dr Speese. Incision below the cricoid cartilage. Profuse bleeding from the veins in front of the trachea. Surrounding tissues very oedematous. From the time the trachea was opened the patient's condition rapidly became worse, and although he breathed through the tube, he could not be kept alive by artificial respiration, which was continued for about fifteen or twenty minutes.

*Autopsy*—Pathological Diagnosis—Œdema of the glottis, unilateral interstitial nephritis, hemorrhagic infiltration of intestinal mucosa. The tissues about the glottis and epiglottis are

intensely swollen. This swelling is so extensive about the glottis that only a chink about 2 mm in breadth and 6 mm in length of the glottis remains.

The writer regards this case as a typical Ludwig's Angina. The following case was reported September 4, 1903, before the North West Medical Society of Philadelphia as a Gun Shot Wound of the Lower Jaw followed by Submaxillary Cellulitis simulating Ludwig's Angina. Since then a study of the literature has shown other cases reported as Ludwig's Angina which were essentially of the same type. The writer considers that this grade of infection in this region has every dangerous characteristic indeed somewhat exaggerated of a typical Ludwig's Angina. The reader is referred to the later discussion on etiology and pathology for the writer's reasons for including it here as an example of this disease.

J. W., colored, age 31 years, admitted to the Philadelphia Hospital August 9, 1903, in the service of Dr. A. C. Wood with whose permission the writer reports the case. His general health and strength were excellent.

On August 8th in a quarrel the patient was shot twice by a revolver in the hands of a companion who stood in front of him and about five or six feet away.

There are three wounds of the face, one of which is a well rounded and perforating wound of the cheek about three-eighths of an inch in diameter just to the right of the symphysis. A second wound with irregular edges is situated on the right cheek about one inch in front of the lobule of the ear. A fragment of a bullet was removed from this wound. The third perforation which was so insignificant and covered by stubby beard that it was not discovered for a few days is shaped like the first and is situated on the left cheek about two and a half inches posterior to the angle of the mouth. The probe enters this wound for about two inches when it strikes what it first was thought to be the ramus of the jaw. A skiagraph later showed a bullet lodged in the tissues in about the situation of this opening. At first the patient did not complain of this wound and it was then thought that

the two on the right side were produced by the two bullets. It seems evident now that they were due to a single bullet which entered near the symphysis, struck the jaw, splintered it, and was divided, one fragment glancing off and producing the wound in the right cheek near the lobule of the ear. Both wounds of the right cheek met within the mouth at the injured portion of the jaw.

The tissues of the interior of the mouth, internal and external to the jaw, are intensely swollen, particularly internal to the jaw in the floor of the mouth. The tongue almost fills the mouth and interferes with normal respiration. Speech and deglutition are disturbed. There are four teeth missing in the lower jaw in the right molar region. The patient says the teeth were not missing before the shooting. In the space corresponding to the missing teeth the alveolar border of the lower jaw is splintered, the loose fragments being removed with forceps. There is a complete fracture of the lower jaw on the right side about an inch anterior to the ascending ramus. The wounds were all washed out and packed with gauze, dressings applied, and a cardboard cup was fitted to the jaw and held by a Barton's bandage.

On the following day the patient's condition became alarming on account of the difficulty in breathing. The face was more swollen, particularly in the submaxillary region. The tongue and the floor of the mouth were more swollen than on the preceding day, and the tissues in the floor of the mouth were more brawny to the feel. The patient was etherized and the two wounds on the right side of the face were enlarged into the mouth. All loose fragments of bone and soft tissue were removed and the wounded tissues irrigated with boric solution. An incision about two and a half inches long was made parallel with the lower jaw and about midway between the hyoid bone and jaw. This wound was deepened until the finger was close to the mucous membrane of the floor of the mouth in the region of the damaged portion of the lower jaw. Irrigation and dressing as before. Temperature 101.3°, pulse 128.

On the following day, August 11th, his condition had improved slightly, but the swelling and temperature were about the same. Respiration, deglutition and speech were still disturbed. On examining the region of the injury to the jaw, the wound in the floor of the mouth was found covered with gan-

gangrenous sloughing tissue and the odor was very foul. The wounds in the lip and cheek leading away from this region were discharging foul pus. A mouth gag was introduced on the opposite side of the mouth and the tongue held away from the infected area thus exposing it. After clearing away all shreds of gangrenous tissue and irrigating with boric solution the infected surface was cauterized with pure carbolic acid which was neutralized at once by applications of alcohol. The patient was placed in charge of a special nurse who cleansed the infected region every half hour with peroxide of hydrogen and boric solution.

On the following day a marked improvement was noticeable. The swelling was evidently decreasing, the patient could talk, swallow, and breathe better, and said that he felt much better. In the few succeeding days the temperature fell to normal. The discharge was still copious and offensive. The septic condition soon subsided and the case resolved itself into one of healing wounds of the face and neck and fracture of the lower jaw which later united.

*History*—Parker in 1879 published an interesting historical review of this condition as recorded before the appearance of Ludwig's paper with particular reference to the cases occurring in England. He gives some details of a case referred to by Auretius which seem to have been those of a Ludwig's Angina. He called the condition *cynanche*. Paulus Aegineta spoke of a somewhat similar condition which he called *paracynanche*. Many of the older authors both Greek and Arab including Hippocrates, Galen, Celsus, Aurelianus, Rhazes and others had described the disease. Dr. Fothergill gave an account of *Putrid Sore Throat* (1739-1746) which appeared to have some of the characteristics of Ludwig's Angina. He also gave an historical review of what is believed to have been the same disease. Dr. Kirkland in 1786, Dr. Wells in 1809, and others reported cases of this type.

It remained, however, for Ludwig to present the first accurate description of this dangerous condition which he called *gangrenous induration of the neck*. Cancer is

the following year was the first to apply to it the name, Ludwig's Angina. Following the appearance of Ludwig's paper considerable interest was manifested and an increasing number of cases were reported. Probably, greater interest has never been shown during any one period, than that which was bestowed on it by the French Surgical Society, in 1892. Several successive meetings were devoted to it and many cases cited by those present. There was a marked difference of opinion manifested, which culminated in a division of the members into two parties, one being led by Nelaton, the other by Delorme. Nelaton took the stand that Ludwig's Angina should not be recognized as a separate disease, and was instrumental in having resolutions to this effect passed by the society. At the following meeting Delorme caused this action to be reconsidered and Ludwig's Angina to be given its proper place in surgical pathology. In the following year Leterrier published a thesis in which he reported 27 cases collected from the literature and communicated four new ones, three of Delorme's and one of his own. The chief object of his paper appeared to be to support the position of his teacher, Delorme, who contended that Ludwig's Angina was primarily a sublingual phlegmon.

In the same year, 1893, Poulsen published the results of a study of 530 abscesses of the neck collected from hospital statistics. In 1886, he had presented a paper in which he reported his observations on a series of lime injections under the deep fascia of the neck, to prove the existence of communicating channels of loose connective tissue between the various adjacent interfascial spaces. In his second paper he attempted to show that infections tended to follow these channels and to invade the various spaces, successively. His explanation of the progress of the infectious process in a Ludwig's Angina will be taken up later in the discussion of the etiology and pathology of this disease.

In 1895, Semon's paper appeared, in which he maintained that acute septic inflammations of the throat and Ludwig's Angina were pathologically identical, and should be

included together as one group of diseases thus eliminating Ludwig's Angina as a separate disease. Since that time nothing new has been offered on this subject so far as the writer can learn.

*Etiology and Pathology*.—Although fairly authentic cases were recorded before practically nothing was presented in the literature to establish the cause and nature of this condition until Ludwig's paper appeared. Since that time many cases have been reported and much has been written which is of value in clearing up the obscurities surrounding Ludwig's Angina. Yet its etiology and pathology still remain obscure. In the writer's opinion one of the basic causes of confusion lies in the obscurity associated with the cause of death in connection with which the chief question is as to whether it results from septic intoxication or from invasion of the air passages. Probably both conditions are always present to some degree in typical cases but the relative importance of each has never been established. If septic intoxication is the essential cause of death then the especially high mortality of this condition is to be explained by the presence of a rare and especially virulent infection. If invasion of the respiratory tract is the dangerous feature peculiar to this condition then the mortality is to be explained by extension of the phlegmonous inflammation to the larynx and in some cases to the lungs. Upon the solution of this question depends in the writer's opinion the explanation of the etiology and pathology of Ludwig's Angina.

Ludwig suggested that it was epidemic in its nature that it was allied to erysipelas and that it was a true morbid entity. Every one of these suggestions has been supported and combatted vigorously by many different authorities and it may fairly be said that they remain unsettled up to the present time. Tissier, Roser and Chabri for example agree with Ludwig as to its being a morbid entity. On the other hand Boehler who collected and studied 33 cases refused to accept this view and tended to suppress the name of L. d.

wig's Angina. v Thadden gave to it the name of "sub-maxillary bubo," while Chantemesse considered it a true erysipelas of the larynx. Roser believed that the disease began in the submaxillary salivary gland. This theory has not been borne out by the post-mortem evidence which has been accumulated. It will not be profitable to discuss here more than a few of the theories which have been offered as to the etiology and pathology of this condition, and it is particularly, to the later authorities that the writer will confine his attention.

As already indicated the investigations have followed two distinct channels, the bacteriological, which attempt to prove that a particular type of infection and therefore a septic intoxication is responsible for the condition, and the anatomical, which try to show that the condition is due to the particular location of the infection and its peculiar opportunities for dangerous extension.

*Influence of Septic Intoxication*—Definite and positive convictions on the relative importance of septic intoxication, can not be reached without difficulty. In studying this phase of the subject, first importance should be given to the bacteriological findings. A search of the literature has shown the following cases in which different bacteria were found and reported:

Delorme, staphylococcus in one case and streptococcus in another, Leterrier, undetermined bacillus in one, Macaigne and Vanverts, pneumococcus predominating, with streptococcus and staphylococcus in one, Lockwood, streptococcus, staphylococcus and bacillus of malignant oedema in one of his own cases and in another, streptococcus, cocci and diplococci. In Gibson's case he also found the streptococcus, Biedert and Robertson, streptococcus in one, Gasser, streptococcus and bacillus coli communis in one, Ross, streptococcus and staphylococcus in one, Davis, streptococcus alone in two cases, and streptococcus and staphylococcus in a third, Ombredanne and Keim, streptococcus and staphylococcus in one, Humphrey, pneumococcus alone in one, Duplay, staphy-

lococcus in one Chantemesse and Widal streptococcus in one Maignal streptococcus in one

It will thus be seen that of the 18 cases the streptococcus was found alone in 6 cases the streptococcus associated with other organisms in 8 the staphylococcus alone in 2 the pneumococcus alone in one and an undetermined bacillus in one

The fact that stands out most prominently in this group of cases is that the streptococcus was present in almost all either alone or associated with other bacteria That it may be present in some cases in which the investigation has failed to show it may be inferred from the fact that Lockwood by different methods found the streptococcus in Gibson's case although Cameron reported that he could find no specific microorganisms in the tissues In all the writer's collection of cases the inflammation of the connective tissues has appeared to be of a severe type and in a considerable number a gangrenous or fetid process has been present The inference to be drawn from these facts is that a severe septic infection and a corresponding grade of septic intoxication has been encountered Yet in many cases the constitutional symptoms have been only moderate or very mild Even if they were severe in all this would not show that they were the cause of the high mortality since the same infections occurring in other parts of the body giving as severe local and constitutional symptoms do not produce the same death rate as does Ludwig's Angina Since the existence of a special infection capable of explaining the high mortality has been searched for carefully by qualified investigators without success in a fairly large number of cases (probably many more than the writer has found record of) we may assume with some confidence that none such is present The clinical as well as the post mortem evidence so far accumulated is decidedly against the existence of such a cause while the evidence in favor of ordinary severe types of infection particularly the streptococcus is very strong

Ludwig whose description of the clinical course has remained the standard up to the present said that in the



first four or five days, the constitutional symptoms were not severe, but became so later. From a study of 104 cases collected from the literature and his own two, the writer believes that this change in gravity of the constitutional symptoms, has a definite relation to the invasion of the mouth and pharynx by the phlegmonous process and that the increase in severity is out of all proportion to the increased area infected, and the corresponding amount of toxins absorbed. This raises the question as to whether the constitutional symptoms are due entirely to septic intoxication, or whether they may not be due in part to interference with respiration. Davis says "whether these deaths are due to suffocation or heart failure caused partly by sepsis and partly by the impeded respiration is sometimes difficult to say." He also adds that "these sudden deaths occur usually in patients in which the epiglottis and larynx are affected and the dyspnoea marked." One would infer from this statement that Davis believes that these sudden deaths are the result of the affection of the epiglottis and larynx. The writer believes that practically all deaths in Ludwig's Angina are to be accounted for in the same way. Some develop pneumonia and pleurisy, while a few may die of septic intoxication. Engelman says that seventy-five per cent of children dying of diphtheria have broncho pneumonia. Diphtheria is a severe infection of essentially the same parts of the throat as are involved ultimately in these cases of Ludwig's Angina, and broncho pneumonia should be as likely to result in one as in the other. Septic intoxication, itself, probably, kills no more patients suffering from Ludwig's Angina, than do these same types of infection occurring in other parts of the body, as in the palm of the hand, the forearm or leg, or in other parts of the neck. "In Robertson and Biedert's case," Davis says "sudden death occurred after a tracheotomy had been performed, so that suffocation could not have been the cause." While it would be difficult to show that suffocation, actually, occurred in this case, the fact that the first symptom complained of was dyspnoea, and that six hours after the onset

it was so severe that tracheotomy became imperative points to the fact that disturbance of the respiratory tract probably killed the patient. In this case as in most of the 14 which Semon reported the phlegmonous process evidently began close to the larynx. In Semon's cases extension to the lungs or pleurae occurred in 5 out of the 6 fatal cases. Pneumonia developed in 3 in one on both sides and in two double pleurisy was present. In two of the eight cases which recovered a double patchy pneumonia was noted. On the same point Davis says further. In one of Ross' cases likewise sudden death resulted while the opening existing through the larynx was sufficient to preclude respiratory obstruction. In this case the focus from which the phlegmonous inflammation extended was evidently the necrotic wisdom tooth and from this focus pus and gas escaped on prying away the tooth. With the beginning of the process only about two inches away from the larynx and within the mouth close to the pharynx it is more than likely that oedema of the larynx developed early. On the fourth day after operation two patches of impaired resonance were made out one in each lung. It would seem to be evident therefore that in both these cases the invasion of the respiratory tract and not septic intoxication caused the death of the patients. Why these cases in which the clinical evidence of oedema of the glottis i.e. the intense dyspnoea is so pronounced as to demand immediate tracheotomy do not recover when this operation permits an apparently free passage of air to and from the lungs the writer is not prepared to explain. That the deaths in these are indirectly or directly the result of the invasion of the respiratory tract larynx alone or larynx and lungs the writer believes. One of his own cases breathed through the tube after the tracheotomy had been performed but could not be kept alive by artificial respiration. In one of Baker's cases tracheotomy was done soon after his admission to the hospital but the pulse stopped during the operation and the patient died. The autopsy showed oedema of the glottis (see autopsy cases). In one

of Tissier's cases, tracheotomy was performed for intense dyspnoea on the day of his admission to the hospital, the third day of the disease. Notable relief followed the operation, but the patient died the same night. In Weiss' case, a tracheotomy was done on the first day of the disease. It was necessary to continue artificial respiration for a half hour to revive him. He recovered. Fenwick's case required a tracheotomy, 4 hours after the beginning of the disease. Great relief followed the operation, but the patient died three hours later. In Gibson's case, swelling began in the neck below the lower jaw, at noon of one day. On the following day the swelling was enormous, extending to the chest and zygoma. The floor of the mouth was considerably thickened, and there was slight dyspnoea. He was admitted to the hospital about 1 P M. At 3 P M of the same day, he became intensely dyspnoeic and tracheotomy was performed immediately, followed by artificial respiration. He recovered and the respiration became normal. On the next day at 11 P M there was dyspnoea and considerable cyanosis of the face and lips. He gradually became comatose and died at 3 15 P M. The autopsy showed oedema glottidis (see autopsy cases). There can be little room for doubt that in all these cases the essential cause of death was the invasion of the respiratory tract, larynx alone or larynx and lungs. Septic intoxication, probably, played only a secondary part in bringing about the fatal result.

It is well known that the partial obstruction of the pharynx from faucial and pharyngeal adenoid growths, will impair the general health of a child by interfering with the normal respiration. Much greater interference coming on suddenly in Ludwig's Angina, from pushing the tongue upwards and backwards and crowding the mouth and pharynx should produce a more serious deleterious effect upon the general condition, the signs of which will be added to and confused with those of the septic intoxication which is already present. When we take into consideration the fact that there was oedema of the glottis in, practically, every fatal case in

the writer's group of cases in which the larynx was afterwards exposed at autopsy it becomes evident that the interference with respiration is greater than is generally supposed. Dyspnoea was noted in nearly all the fatal cases and in the opinion of the writer it is the invasion of the larynx and lungs not the septic intoxication which is the peculiarly dangerous feature of Ludwig's Angina. It is sufficient to explain the high mortality septic intoxication is not.

While in most of the cases it is difficult or impossible to differentiate between the parts played by these two factors in a few it is shown clearly that all the alarming symptoms characteristic of a Ludwig's Angina may develop in the absence of severe constitutional symptoms as in the following. Where temperature alone is given it should be borne in mind that this was the only symptom mentioned in the report of the case from which one could infer the degree of the constitutional disturbance and where it is not given here it was not mentioned in the report and any statement implying the degree of constitutional disturbance or absence of it was extracted and employed in these brief summaries. In one case reported by Huguet and DeBovis there was an extensive submaxillary swelling enormous sublingual swelling dysphagia dyspnoea and a considerable quantity of fetid pus yet the temperature never went above 39°C (102°F). In one of Parker's cases the usual severe symptoms were present except dyspnoea which may have borne some relation to the presence of a discharging sinus in the floor of the mouth. This may have checked the progress of the inflammation towards the larynx. The general health was not impaired. In another of Parker's cases the general health was reported to be good. Leube's case which underwent resolution had a normal temperature. In Trumps case and in three of Davis' cases the temperature was only 101°F. In Margerison's the temperature was 100.8°F pulse 104 and in Humphreys it was never above 100°F. Leterrier reported that in his case the general condition was good the temperature 37.4°C (99.3°F) and that the patient

would have taken food if he could swallow. All these cases recovered. Michel's patient was admitted to the hospital on the 5th day of the disease, when he had an enormous submaxillary swelling. On the day preceding admission asphyxia was threatened. He died 4 hours after admission. The temperature was given at  $39^{\circ}\text{C}$  ( $102^{\circ}\text{F}$ ). One of Schwartz's cases, on the day of admission to the hospital, insisted on going out again to attend to some business, which he was permitted to do. He returned later in the day and died of syncope that night. In Gibson's case, the submaxillary swelling began at noon of one day. On the following day at 1 P.M., when he was admitted to the hospital, the swelling was enormous. A little later the dyspnoea became intense. Tracheotomy was performed and artificial respiration carried out with relief to the patient. At 3 P.M. of the same day he died in coma and dyspnoea. Yet the temperature on admission, 2 hours before death, was only  $97.8^{\circ}$ . In Fenwick's case, the swelling began in the morning. Two hours later the face was almost unrecognizable. In 4 hours he was cyanosed and could hardly breathe, and in 7 hours he was dead. Yet the temperature was normal, the pulse 140. It would seem, therefore, that in some cases essentially all the symptoms of a Ludwig's Angina may be present, and those of septic intoxication be very moderate or practically absent. Indeed, in only a comparatively small number of the cases collected by the writer, was high temperature referred to, and in the great majority the presence of severe constitutional disturbance could only be inferred from the general gravity of the case. Inspection of the autopsy cases given later, will confirm this statement.

*Influence of the local condition*—While definite results have never been obtained from bacteriological investigations, beyond the fact that the streptococcus is present in nearly all the cases, pure or mixed with other organisms, the study of the local inflammatory conditions have yielded more satisfactory results. The observations of Poulsen, Delorme, Semon and more recently Davis, in the writer's opinion, have

been the most valuable of recent years. These writers seemed to consider the infection from a distinctly local standpoint and to regard the larynx as the essentially vulnerable point of attack.

Poulsen says that the deep cervical fascia in the submaxillary region is dense and resistant and that the submaxillary salivary and lymphatic glands are enclosed in a fascial space. This submaxillary fossa communicates by means of loose cellular tissue and blood vessels with the deep retromaxillary fossa so that a cellulitis beginning in one of these spaces readily extended to the other through this communicating passage. He explains the dangerous symptoms of dyspnoea and dysphagia in Ludwig's Angina by an extension of the inflammation through the wall of the pharynx to the pharynx and larynx from the retromaxillary fossa. He contended that those cases beginning with a preliminary angina gave secondary involvement of the lymphatic glands in the retromaxillary fossa about the bifurcation of the carotid artery and that the resulting periglandular cellulitis then passed through the wall of the pharynx. When the phlegmonous process began in the submaxillary lymphatic glands as from a carious tooth or ulcer in the tongue or floor of the mouth the overlying strong fascia gave rise to great tension so that the inflammation seeking the direction of least resistance passed along the communication to the retromaxillary fossa and thence through the wall of the pharynx to the pharynx and larynx. Poulsen's conclusions are not based upon strictly anatomical studies but upon the results of his lime injections. When the lime was injected under the deep fascia in the submaxillary region it first produced a swelling in this region which was soon followed by extension to the region of the large vessels of the neck and almost simultaneously to the alveolo lingual sulcus in the floor of the mouth. In no case did it work its way through the wall of the pharynx the path by which Poulsen claimed that the inflammation reached the larynx. He obtained hospital statistics of 530 abscesses of the neck of which 251 occurred in the submaxillary region. Of the 251 there was a swelling in the floor of the mouth or alveolo lingual sulcus in 22. In 2 of the 22 there was a spontaneous opening in the floor of the mouth in one at the orifice of Wharton's duct. As a rule the inflammation

subsided after incision in the submaxillary region, and only twice was the cedema so abundant that an incision in the mouth was necessary. Of the 251, 11, or 4 per cent, died. Poulsen considered that only three corresponded to the clinical picture of Ludwig's Angina, in which he attached especial significance to the non-fluctuating swelling in the submaxillary region, the lack of large pus foci, the intact skin, and the extension of the swelling to the floor of the mouth. He eliminated one of these because of the absence of an autopsy. The writer has included the other two in his collection of cases, and they will be found among the autopsy cases.

The two points in Poulsen's paper, to which the writer attaches greatest importance are first, that Ludwig's Angina results from the extension of an infection of the neck to the larynx and pharynx, and secondly, that the cellulitis had its origin in extension from the lymphatic glands. He was far, however, from proving the path of extension. His most important evidence lay in the fact that in several cases, when the abscess was opened the finger of the surgeon could be passed down to the pharyngeal wall, the infection being traced in this way nearer to the pharynx and larynx than in any other direction. He attached considerable significance to the fact that in one case, not regarded by him as a Ludwig's Angina, during the making of an external incision into the abscess, there occurred a spontaneous opening into the throat. In no cases did he demonstrate an opening in the pharyngeal wall. Spontaneous openings have been reported rather frequently, generally in the mouth, some of them occurring near the base of the tongue or in the throat, and are readily explained in another way.

As the result of his clinical observations and experience Delorme concluded that Ludwig's Angina was nothing more than a sublingual phlegmon, although on account of its exact anatomical seat and constant symptoms, he was inclined to view it as a morbid entity and to retain the name of Ludwig's Angina. Leterrier in his thesis, already referred to, offered two arguments to support Delorme's theory. In the

first place it was found necessary in all their cases to cut through the mylo-hyoid muscle from the neck and therefore into the sublingual tissues before pus was reached. In the second place according to Leterrier the almost constant swelling in the floor of the mouth and the elevation of the tongue could be due only to a sublingual phlegmon. He also added that when there was a spontaneous opening made by the pus it was usually internal. He believed that if this theory was generally accepted and the external incision extended deeply enough the mortality would be much diminished. All of their cases recovered. A number of writers particularly in France accepted Delorme's view and reported Ludwig's Angina as synonymous with sublingual phlegmon. Huguet and DeBovis who collected and studied 49 cases regarded them as sublingual phlegmons but held that these sublingual phlegmons can only be the result of diffusion of an inflammation developed more posteriorly in the region of the parotid or angle of the jaw. They believed that its anatomical seat was intramuscular and that it was a basic glossitis. They could not admit that a purulent collection under the mucous membrane in the floor of the mouth would produce a hard non fluctuating swelling and they added that some surgeons who have intervened by the mouth have not met with success or have had to plunge the bistoury to a considerable depth.

With reference to this point the writer has investigated his 104 collected cases with the following rather indefinite results. Nelaton made a sublingual puncture only blood escaping. Later he made two external incisions one a supra-hyoid incision exposing a purulent focus the other a submaxillary incision only infected serum escaping. Death resulted from syncope. No autopsy. Chauvel made a double sublingual incision and exposed a gangrenous focus above the mylo-hyoid muscle extending to the upper border of the thyroid cartilage. (Extension to the thyroid cartilage implies that the focus was below the mylo-hyoid muscle also and therefore in the neck.) Dubois found phlegmonous pus



by a sublingual incision Haering made buccal scarifications but found no pus Cuffe made a buccal incision toward the posterior part of the tongue but found only blood Later the incision was repeated and pus was found Holthouse made buccal scarifications but found no pus Ross found no pus by a sublingual incision, but with an external incision located a large abscess Ripault evacuated 2 or 3 cupfuls of pus by a buccal incision, and by a median external incision also found pus There were sublingual and retromaxillary fluctuation in this case

In most of the cases, however, it was the external incision which located the pus, and in only a few was the mylohyoid muscle said to be divided The writer will show later that the sublingual phlegmon is the result of extension in the great majority of the cases, and that it is not the primary phlegmon as Delorme maintained Leterrier explains the origin in the sublingual tissues by assuming that the infectious germs gaining entrance by a focus in the mouth as a carious tooth or an ulcer, are carried by the lymphatics to the cellular tissue about the sublingual gland He says also that Richet has described a chain of lymphatic glands arranged in a horse shoe manner along the internal surface of the inferior maxillary bone, thus implying that if these glands existed, they would explain the frequency of cellulitis by periglandular extension

Semon's paper, which appeared in 1895, is the most recent to attract wide attention His conclusions are based upon clinical observations on 14 cases, which he saw in 20 years of special practice as a laryngologist The main conclusion he reached was that "these acute septic inflammations of the throat and neck, described by a large variety of terms, such as acute oedema of the larynx, oedematous laryngitis, erysipelas of the pharynx and larynx, phlegmon of the pharynx and larynx, and Angina Ludovici, are pathologically identical They merely represent different degrees of severity of one and the same septic process due to invasion of the throat and neck by various micro-organisms" He

adds that this can be finally proved only by a harmonious combination of clinical pathological and bacteriological evidence. In every one of his cases except the first he had tried to obtain a bacteriological investigation but only in the last was this opportunity afforded and then the evidence was purely negative. He called attention to the fact that Virchow could not exactly define the mutual relationship between erysipelatous and phlegmonous affections. Semon believes that the question of the primary localization and subsequent development depends in all probability upon accidental breaches of the protecting surface through which the pathogenic microorganisms gain entrance to the tissues.

According to Semon therefore we are not concerned with any particular infection so much as with a special type of inflammation an acute septic phlegmonous process which may be due to various microorganisms. Lockwood who studied this condition from the bacteriological side reached the conclusion that Ludwig's Angina is a mixed infection of the most complicated kind and that several pathological conditions are included in this affection. He found that usually the streptococcus was present though not always and that this microorganism may be present alone or associated with other organisms as the staphylococcus. From his study of the subject the writer prefers to accept Semon's view on this point. The complicated nature which Lockwood assigned to this infection becomes simplified by the fact that whatever microorganism is found the process is always the same a rapidly spreading phlegmonous infiltration of the cellular tissues. This is the result usually produced by streptococcus infection and it may be due to staphylococcus infection. Gasser quotes Queno as saying that any of the pyogenic organisms may be found in these cases. Other organisms may also produce it as the bacillus of malignant oedema which Lockwood found in one of his cases. We are not yet familiar with the exact results produced by the various bacteria and Semon's statement seems sound that it is absolutely impossible to draw at any point a definite line of demarcation be-

tween the purely local and the complicated, or between the oedematous and suppurative forms”

Semon maintains, however, that all acute septic phlegmonous inflammations of the throat and neck should be classified together, and that Ludwig's Angina as a separate disease should be eliminated. That they are all pathologically identical and that the throat, *ie*, the larynx, is the most vulnerable point in all, the writer believes. From the standpoint of prognosis and treatment, however, there is a very practical difference between those in which the phlegmonous process begins in the throat and those in which it begins in the neck, where the condition described by Ludwig had its origin. Many of the latter have shown a preliminary angina, it is true, but this usually disappeared later and did not form a part of the phlegmonous process beyond serving as the portal of entrance for the microorganisms. In most of Semon's cases and in one of the writer's collected cases, the acute septic process began in the throat and spread out from there. These in the writer's opinion, form a distinct group, and are laryngological, those which Ludwig described are distinctly surgical and in the majority of cases respond to surgical treatment. The following advice given by Semon, may be proper for the former but not for the latter. “Should there be anywhere distinct fluctuation or merely justifiable suspicion of such, of course you will incise upon such foci. Our promise for the future must depend on the fact that we have a bacterial infection, and that by the injection of an appropriate antitoxine we may be able to save the patient.” Fluctuation or even a suspicion of it is practically never present. Prompt and suitable incision in the absence of any sign of fluctuation, has arrested the progress of many cases, probably, after oedema of the larynx had already set in. Antitoxines may be employed with advantage after incision and drainage have been provided, but not before.

No fact is more evident from a study of the literature, or is so generally conceded, than that the cellular tissue is

the essential seat of the inflammatory process and that the surrounding structures become involved by contiguity. The literature also shows clearly notwithstanding the claims of Delorme and his followers that in the great majority of cases the cellulitis originates externally in the submaxillary region and not in the sublingual region i.e. in the mouth. Of the writer's 106 cases in 61 the swelling was first noted in the submaxillary region of one side. In 16 it was bilateral and under the jaw when first seen by the physicians reporting them. In 2 there was a submental swelling which may have been a bilateral submaxillary involvement. In 13 others the swelling was described as involving the cheek and neck, face and neck, parotid region etc. i.e. it was in the beginning an external swelling. Of the 106 therefore 92 began in the tissues of the neck external to the mouth and throat. In 8 cases the first swelling was sublingual and from the description in 3 (Huguet and DeBovis 2, Holthouse 1) the writer considers it doubtful whether a sublingual or a submaxillary swelling first appeared. In two cases (Tordeus and Aldrich) it was described as a submaxillary and sublingual swelling. One case began in the throat as in Semon's cases and is included here because it was considered by the writers reporting it as a Ludwig's Angina. The writer regards these facts as of much value in establishing the nature of the disease and considers that they support what Ludwig claimed that the cellulitis begins in the submaxillary region at least in the great majority of cases. Those which begin in the mouth can be easily accounted for but there has been much dispute concerning the submaxillary origin and the term idiopathic has been employed in connection with them. Semon says

A little abrasion on the side of the neck exposed to the action of those pathogenic organisms may of course invade the body from the outside and may cause what has hitherto been called an Angina Ludovici. The original focus is purely accidental. One would infer from this that Semon considers that from such an abrasion invasion occurs by direct continuity of tissue until the throat is involved.

Davis says "When the teeth are the starting point the inflammation involves the periosteum of the lower jaw and thence invades all the surrounding tissues. While the point at which the infection starts localizes the disease at its commencement, it progressively spreads and invades all the tissues within its scope. No matter how it commences it spreads along the connective tissues by direct continuity. It is not transmitted by the lymphatics. The lymphatic glands do not become enlarged by infection carried to them by the lymph stream from the infectious focus, but they are involved in the connective tissue surrounding them." As already stated Leterrier considered that the infection was transmitted from some focus in the mouth to the cellular tissue about the sublingual gland setting up a cellulitis there. Roser believed that the infection was transmitted to the submaxillary salivary gland, and that the extension occurred to the surrounding cellular tissue.

That the primary focus in the great majority of cases is some insignificant lesion in the mouth, as a carious tooth, an herpetic or other ulcer, a tonsillitis, etc., has been generally admitted and so far as the writer can learn has never been denied. In many, however, no such focus was discovered. If the infection gains entrance to the tissues by such a focus in the mouth and the signs of inflammation first appear in the submaxillary region, external to the mouth and some distance from the original focus, the process can not be said to have extended by direct continuity of tissue. This applies with greater force to those in which no preliminary focus could be found, the typical, so-called, idiopathic cases. The writer's statistics on this point will be found later in connection with the clinical course of this condition.

There can be only one explanation for such a transference of infection, and that is by way of the lymphatic vessels to the glands in the submaxillary region. Most infections in this region are of glandular origin. Poulsen said that the great majority of his 251 submaxillary abscesses were cases of simple or localized adenitis, and he takes it for

granted that his cases of Ludwig's Angina began also in the lymphatic glands v Thadden considered it a lymphatic disease and gave to it the name Submaxillary bubo. Localization of infection is the rule in any part of the body and this is particularly true of those which lodge in lymphatic glands. Fulminating cases are rare. Typical Ludwig's Angina is rare and is also fulminating. It is easily conceivable that such an infection might be transferred from some slight focus in the mouth where there is no retention the discharge being free to a submaxillary lymphatic gland where the infection is confined and therefore more active and from there on account of its increased activity invade the periglandular tissue so rapidly that its glandular origin is overlooked. In some cases the glandular origin was indicated by an early localized pain in the submaxillary fossa which was soon followed by rapid swelling.

While the glandular origin was concealed by the rapid swelling in most of the writer's cases this was not true of all. In one of Tissier's cases there was pain in the left submaxillary region on the first day. Swelling appeared on the following day. In one of Delorme's cases the condition was first observed in the submaxillary region as three glands rapidly increasing in size. Bauer reported one in which the patient had similar attacks before. Ludwig's case in 4 days had only reached the size of a hen's egg. One of Haering's when first seen was of the same size. Heyfelder's the size of a goose egg and Timpe's of a five franc piece. Davis says of two of his cases that one week before the neck began to swell and later increased rapidly. In Blasburg's case there was an indolent swelling for 8 days and rapid swelling began on the 11th day. In the writer's case there had been a small lump for about a week before rapid swelling began. There can be little doubt of a glandular origin in these cases and in the writer's opinion they go far toward proving the glandular origin in the so-called idiopathic cases.

(To be continued)

# EXPERIMENTAL SURGERY OF THE LUNGS

## I THIRTY ANIMAL OPERATIONS UNDER POSITIVE PRESSURE

(A PRELIMINARY REPORT)

BY SAMUEL ROBINSON, M D,

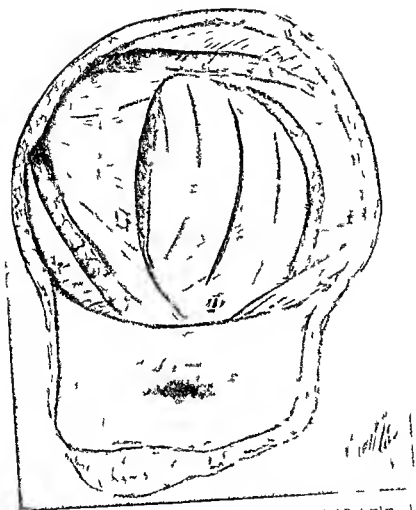
OF BOSTON, MASS,

From the Division of Surgery and the Department of Physiology  
of the Harvard Medical School

THE slow advances in surgery of the thorax during the eighteenth and nineteenth centuries are abundantly portrayed in the publications of the last ten years. I will omit them in this preliminary report. Suffice it to say that the year 1904 marks the beginning of a new epoch in the history of intra-thoracic surgery. I refer to the works of Sauerbruch and Miculicz at Breslau, and of Brauer at Heidelberg. Most publications since that date have been based on the theories advanced by these men.

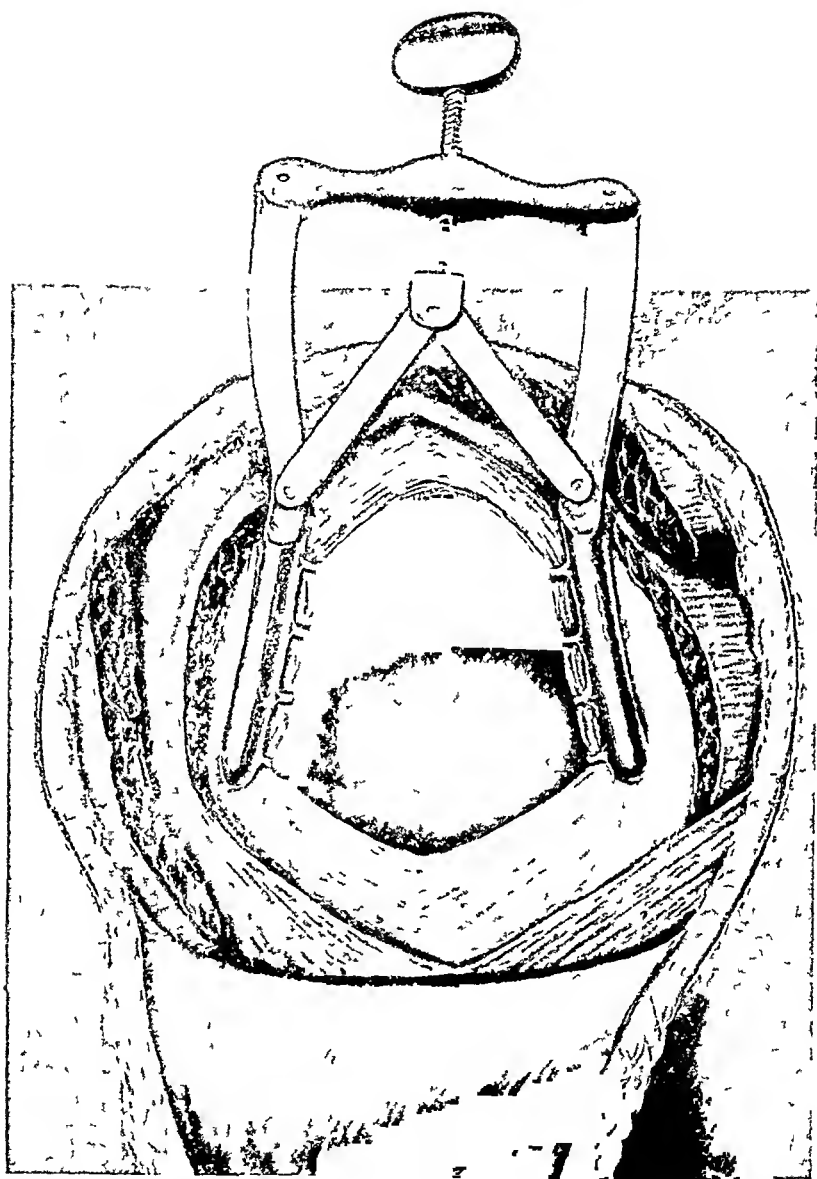
The comparative infrequency of intra-thoracic operations at the large surgical clinics in this country and in Europe, indicates at once the danger which is associated with operations performed under the older methods, and we are inclined to credit the few recoveries which have occurred rather to the "Hand of Providence" than to the skill of the operator.

Successful operations in the pleural cavity demand at least one factor,—the avoidance of lung-collapse. If atmospheric air is allowed to enter and remain in the normal pleural cavity the lung will collapse. The effect of lung collapse is a series of circulatory, nervous, and respiratory disturbances which, if collapse is continued, result in death. A discussion of the many theories as to the pathology of pneumothorax will be included in a second paper. The fatal effects of collapse of the lung must be avoided in one of two ways. Air must not be allowed to enter between the visceral and parietal



k fl p (AA) P t ralm l  
 p fb f t rn l bl q  
 b d eth b





DRAWING II —Showing use of rib spreader Jaws including intercostal stumps and pleural edges

layers of the pleural cavity thus forming an actual pleural space or else the lung must be kept artificially inflated. The former is the key note of all the older methods of avoiding collapse in operations in the chest. A safe operative field if not already caused in the form of inflammatory adhesions between the two pleural layers has been produced by the artificial formation of such adhesions through injections of irritating media by prophylactic suturing of the pleura layers around the field to be operated or lastly by the immediate withdrawal into the pleural opening of a lobe of the lung thus preventing the further entrance of air at the same time preventing the actual retraction of the lung towards its root which in itself is sufficient to cause circulatory changes which result in threatening symptoms. The disadvantages of these earlier methods of avoiding collapse are self evident. Inflammatory processes cannot always be trusted to connect the parietal pleura with deep seated abscesses thus giving clinical evidence of their localization and a walled off channel for their approach. It is also apparent that in the absence of such localized signs an artificially produced adhesion as by the use of chloride of zinc or suture may not be made at a point through which the cavity to be emptied can be reached. Such mistakes lead to unnecessary probing of normal lung tissue in the vain search for pus.

If an operator ventures the risk of pneumothorax by opening the cavity and withdrawing a neighboring lobe through the wound to prevent collapse he immediately obstructs his approach to exploratory procedures and at the same time causes respiratory and cardiac disturbances by the irritation of the vagus terminals from manipulation and traction of the lung. (See sections of tracing at this stage of operation.) Releasing the traction will again be attended with signs of lung collapse. A certain amount of intra thoracic work can be done before threatening symptoms require the replugging of the wound. Such operating is however too precarious to permit of due care—the danger point is constantly too imminent.

The one salvation then of these methods of operating is the presence of adhesions and it seems reasonable to assume that the majority of successful intra-pleural operations have been done in the presence of such adhesions, in fact most lesions of this region are accompanied by more or less inter-pleural involvement

Until free exploratory pleurotomy and intra-thoracic inspection become thoroughly safe procedures the advance of intra-pleural surgery must be restricted

The recent somewhat promising wave of advance is along the lines of artificial inflation of the lungs by means either of negative pressure, applied to the outer surface of the lungs, or positive pressure to its inner aerating surfaces. Since the seventeenth century, varieties of artificial respiratory apparatus have been used in physiological laboratories to prevent lung collapse during experiments on the respiratory and circulatory apparatus

In his publication of 1904 Sauerbruch<sup>1</sup> states his objections to the use of such positive pressure respiratory apparatus for experimental surgery in which the recovery of the animal was desired. His objections are as follows

1 The change in the method of breathing (That is to say rhythmically inflating the lungs regardless of the normal reflex mechanism of breathing)

2 Interstitial emphysema of the lung, as result of the artificial impumping of air into the lung

3 The effect on the circulation

4 The persistence of a pneumothorax at the abandonment of the artificial inflation

5 The great loss of heat

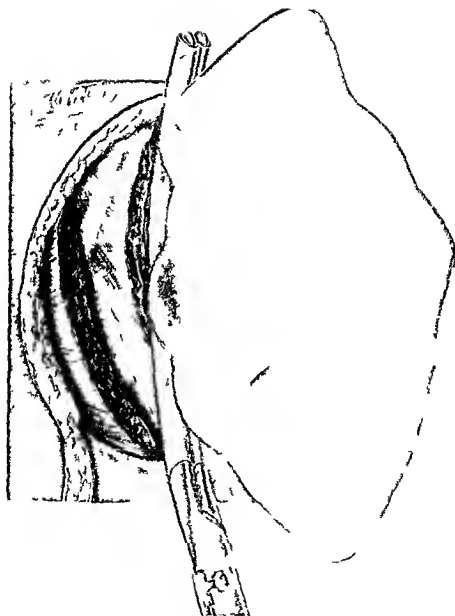
6 The great danger of infection to the pleura as a result of the extensive exchange of air in the pleural cavity

7 The necessity of tracheotomy

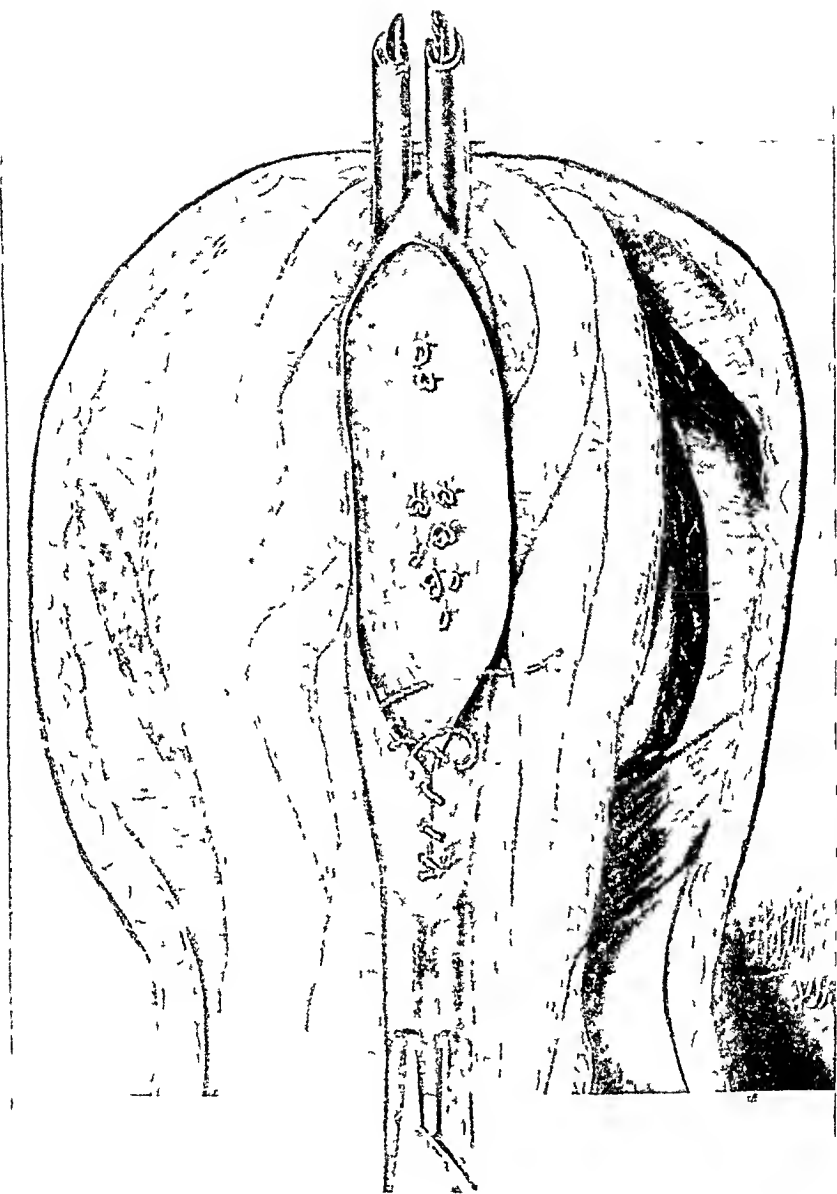
8 The difficulty of narcosis

Sauerbruch, therefore, constructed the pneumatic chamber which is now well known. To describe briefly, the

<sup>1</sup> Mittheil a d Grenzgebieten z Medizin u Chirurgie, xiii, b d, p 399



D. W. III - I. W. ht 1 be w thdra d 1 mped



DRAWING IV —Showing boat shape of stump and beginning of first row of inverting sutures

operator and assistant and the patient's body and extremities are within the cabinet the head protruding through a rubber drum at one end into the outside air. The etherizer is therefore outside the chamber and the anesthetic can be administered in the usual way. A negative pressure can be maintained within the cabinet which does not embarrass the breathing of the occupants but is sufficient to prevent collapse of the lungs in intra thoracic operations. Sauerbruch claims that by this negative pressure inflation all of the above eight objections to the use of the ordinary artificial respiratory devices are obviated.

A few months after this publication Brauer who with Petersen had been experimenting with the positive pressure in Heidelberg published an article in support of the method. He did not attempt to deny the success of the cabinet in avoiding the symptoms of collapse nor did he enumerate objections either to its construction or possible harmful effects. He devoted himself largely to the description of his own apparatus and refutes at great length the third of Sauerbruch's objections namely the disturbances of circulation resulting from the use of the positive pressure which are supposed to be greater than under negative pressure.

The apparatus recommended by Brauer consists in brief of a metallic box in one side of which a large rubber collar is inserted. The patient's head is inserted through this collar which in turn is adjusted air tightly around the neck. The patient's face can be watched through a glass window in the top of the helmet. Holes in the side walls fitted with elastic cuffs admit the etherizer's hands without leakage around them. Ether is introduced into a compressed air or oxygen conduit which leads to the helmet. Exhaled air is provided with an exit which meets the resistance of a water column.

As stated by Brauer the negative pressure cabinet possesses the great disadvantages of costliness and weight. The expense of construction is sufficient to render it unobtainable to other than well provided hospitals and quite out of the

question for private work. Its size and weight render transportation impossible. It is, however, being given a practical trial as to its serviceability, with considerable success.

The objects in the following investigations were as follows: 1 To perfect a suitable apparatus for the employment of the positive pressure method. 2 To test the objections of Sauerbruch, first on the basis of practical surgical experiments and, provided these experiments were satisfactory, to further examine his statements with blood-pressure, respiratory and cardiac tracings to see whether these functions are much disturbed when a perfected positive pressure is applied.

The apparatus which I have constructed, as shown in photograph A, has proved most satisfactory. It can be recommended as practical at least for experimental surgery of the thorax, for experiments in physiology, and pathological physiology, and for anatomical demonstrations of the relations and appearances of the thoracic viscera. It obviates the necessity of an etherizer, and can readily be controlled by the person operating. For other than thoracic operations, it can be so adjusted that the anesthesia is administered automatically for an hour, without danger of over-etherizing.

Previous to the operations on dogs described below, seven experiments were performed on cats to familiarize myself with the following factors:

- 1 Effect of ether when applied under air compression
- 2 Amount of heat required for ether vaporization
- 3 Possibilities of masks of various shapes for application to animal's face for administration of ether under positive pressure
- 4 Construction of apparatus to hold such mask firmly in position
- 5 Effects of variations in size of afferent and efferent tubes to mask
- 6 Different methods of regulating amount of anesthesia administered
- 7 Results of pneumothorax with small opening

- 8 Results of wide open pneumothorax
- 9 Results from manipulation of lungs
- 10 Effect of positive pressure application under the above three conditions
- 11 Effect of variations in this pressure
- 12 Effect of excision of greater or less portions of either or both lungs under positive pressure

Having thus become familiar with the well known fact that the thorax may be opened and large portions of the lungs removed under the influence of air pressure without causing immediate death I commenced the following series of operations to determine how extensive operations may be performed on the lungs with a reasonable hope of recovery

**CASE I—Operation** *Simple pleurotomy Rib excision* **Result**  
*Death Cause Septic pleuritic effusion* March 1907 Small mongrel weight 15 pounds Asepsis not thorough Face mask poorly fitting Simple temporary positive pressure device inconvenient favoring sepsis  
 Skin and muscle flap triangular in shape to expose fifth rib near sternal end Fourth and fifth intercostal muscles divided near 4th and 5th ribs respectively One inch of 5th rib with attached intercostals excised and lifted from parietal pleura. Latter incised 4 cm. Act on of right lung observed for half hour Continuous cat gut stitch with tufts 8 mm apart picking up pleural edges and when possible intercostal stumps Pectoral muscle stumps approximated with interrupted stitches Interrupted silk to skin Time about 1 hr 30 min Collodion painted over wound no swathe Animal walking with stagger 15 minutes after removal of ether

March 23 1907 Temperature 103 Tail wagging Able to stand on hind legs leaning

March 6 1907 Temperature 10° (normal) Respirations increased and somewhat labored mucous membranes cyanotic Dullness on percussion of right chest Lying down Died during afternoon

*Autopsy* March 6 1907 Skin incision clean muscle suture parted one fourth its length Pleura lying open below hole in muscle. Twelve ounces of sero hemo rhagic fluid in right chest. Lung partially collapsed Area of thickened visceral pleura over middle lobe No fibrin or lymph Left chest normal Ounce of fluid in pericardial sac. Excised lung readily inflatable throughout

Diagnosis Leakage wound Pneumothorax. Pleuritic effusion septic

**CASE II—Experiment** *Prolonged application of positive pressure without pleurotomy* **Result** *No ill effects* March 29 1907 Black and white fox terrier female weight 14 pounds Object To determine whether pleuritic effusion in Case I was caused by use of positive pressure with possible congestion of lung and mechanical transudate



Animal etherized Positive pressure apparatus applied and animal kept under it for about two hours with 6-8 mm of mercury resistance Pneumograph applied to abdomen and tracings made

Animal came quickly out of ether within half an hour of removal of cone, and was able to run upstairs to the roof

Three days later animal appeared entirely normal and showed no cyanosis or difficulty of respiration It was decided that there had been no ill effects from positive pressure apparatus as such

CASE III—Operation *Simple pleurotomy* Result *Recovery after localized empyema* April 2, 1907 Same dog as Case II Object To improve on technique of closing pleural cavity hermetically Asepsis not thorough

Curved incision in anterior right thorax, making semi-circular skin and muscle flap, diameter  $2\frac{1}{2}$  inches Internal and external intercostal muscles of 5th interspace dissected with difficulty away from parietal pleura, leaving interosseous field  $\frac{1}{2}$  inch in diameter Interosseous vessels controlled with pressure Pleurotomy Respiration became deeper and less frequent mucous membrane of mouth seen through glass mask to be cyanotic Resistance in water column increased to 8 cm of water Mediastinum blown forcibly into wound Finger introduced to posterior thoracic wall and withdrawn Attempt made to suture pleural edges but latter had retracted under ribs so that perfect approximation was impossible Air could be heard rushing between turns of continuous stitch at respiration Trusted that interrupted cat-gut suture to muscle and silk to skin might render flap means of air tight closure

Immediately after recovery from ether respirations were somewhat labored

April 3 Temperature 106, respirations 40, pulse 160 Inclined to lie down

April 4 Temperature 105, respirations 45, pulse 170 Swathe and dressing soaked with serous discharge Removed Air heard sucked in and out of chest through wound Dressing applied with pressure

April 5, 6, 7 Eating well More active Stitches out on fourth day Wound septic but granulating Free access of air in and out of cavity was noted

Dog became normal in habits at end of one week Profuse purulent discharge from wound continued for five weeks, and gradually granulated to closure

Diagnosis Air leakage in wound sepsis localized empyema

*Autopsy* Killed with ether, eight weeks after operation Cohesions between original wound and adjacent surfaces of muscle and lower lobes No fluid or pus in cavity Lung tissue apparently normal

CASE IV—Operation *Simple pleurotomy* Result *Recovery* Object To improve technique of closing cavity and to increase asepsis Recovery of Case III was doubtless accidental, owing to early pleural adhesions localizing pneumothorax and suppuration April 7, 1907 Brindle mongrel, female, weight 18 pounds Careful aseptic precautions Chest shaved Soap and water Alcohol Sterile towels

Positive pressure 4-6 mm of mercury Pressure introduced before pleurotomy thus a aiding dyspnoea Pneumograph tracings showed no change but slight increase in depth of respiratory excursions Gridiron incision Semicircular flap with convexity dorsad Muscle divided separately in same curve External oblique origin divided at right angles with skin incision exposing 5th 6th and 7th ribs 5th rib incised  $\frac{3}{4}$  inch together with half of intercostal muscles above and below respectively Less intercostal bleeding than in Case III Pleurotomy  $\frac{3}{4}$  inch Pleural cavity and lung not handled Pleural stitch (black intestinal silk with smallest curved eye needles) included portion of intercostal tumors which were of necessity stitched to cross space occupied by excised rib Second row continuous suture picking up same tissues External oblique approximate 10th catgut Also pectoral muscle Subcutaneous layer with catgut Interrupted and continuous silk to skin Time hours 30 minutes Prompt recovery from ether Walking in 10 minutes breathing not labored

April 8 Pulse 108 respirations 30 Running about Jumps to 2 foot bench Convalescence entirely normal Milk diet for two days then raw meat Dog presented no symptoms or signs from time of operation Wound solid on fourth day Stitches out on seventh day Two weeks later used again in physiological experiment

CASE V.—Operation Excision of tip of right middle lobe Result Death on sixth day Cause Sepsis Pneumothorax from leakage of stump Object Encouraged by success of Case IV attempted to make larger pleural cavity opening with excision of piece of lung tissue

April 16 1907 White mongrel female weight 20 pounds Chest shaved on previous day reshaved scrubbed with soap water alcohol and corrosive Square skin flap (3 inches diameter) reflected outwards exposing right 4th 5th and 6th ribs Pectoral and external oblique muscles not at opposing angles One inch of 5th and 6th ribs excised with intercostal muscles connecting Just before pleurotomy animal suddenly stopped breathing Probably due to excess of ether Apparatus converted into artificial respiratory one and breathing restored by twelve rhythmic inflations at intervals of about 1 seconds Breaks in asepsis repaired and operation continued Parietal pleura divided diagonally across field Tip of middle lobe ligated with catgut and amputated  $\frac{1}{8}$  inch from ligature Stump dropped back Mediastinum blown into round by pressure from unoperated side inferior diaphragm suture of pleura Scalpel stuck into left chest and turned to allow left pneumothorax Mediastinum retracted to its median position Pleural edges approximated with continuous silk at end of wound Two interrupted sutures in centre the latter of which was drawn tight at end of inspiratory excursion (see correction in later operations) Pleural stitch leaking Lateral tears due to lack of support of intercostal muscle tissue Wound sutured in layers Scalpel wound of left chest closed with one skin stitch Tight swathe applied over sterile dressing

April 17 Temperature 101.6 pulse 150 respirations 60 Dog languid but drinking

April 19 Temperature 105, pulse 180, respirations 75 Slight dullness elicited by percussion of right chest Decided not to attempt secondary measures

April 22 Died In three days previous food and water refused

*Autopsy*—Skin and first muscle layer clean and dry Pleural wound gaping with continuous silk stitch lying free in cavity wrapped in fibrin Right chest contains 10 ounces of sero hemorrhagic fluid with purulent sediment Visceral and parietal pleuræ covered with fibrinous exudate and lymph, which could be removed with finger Lungs excised and inflated Ligature had slipped off tip of movable lobe and air was heard escaping from pin-point opening in stump No pneumonic or atelectatic areas in either lung Left pleural cavity contained 5 ounces of similar fluid without fibrin shreds Left lung normal Cultures of pleuritic fluid saved for examination

The operation as such of Cases I, II, IV and V, with a mortality of 50 per cent, are simple to the extreme They are reported, however, to show the necessity of absolute asepsis and painstaking technique for the hermetical closure of the lung stump and of the chest wall Just why a pleuritic effusion occurs in these fatal cases will be discussed in a later paper on the basis of pathological physiology I was, however, convinced at this time by the cat experiments, and by the success of Cases II, III and IV, that the cause of fatalities must be sought, not in the positive pressure resistance to the lung, but rather in the intrinsic unreliability of the apparatus used in the above cases, in the breaks in asepsis necessitated by this unreliability, and lastly in undeveloped surgical technique It was evident that the removal of two ribs together with intercostal musculature rendered approximation of pleural edges difficult, and that of intercostal stumps impossible It seemed advisable also to adhere to simple pleurotomy until technique was perfected

The apparatus used in the above cases was an improved one, consisting of a small ether bottle with rubber-tube connections for conduction of air, also an outlet tube to a water bottle The mask was smaller than that shown in photograph A

CASE VI—Operation *Simple pleurotomy One rib excised* Result *Recovery* Object To obtain recovery after simple pleurotomy under positive pressure of improved apparatus Two-rib excision abandoned

July 19 1907 Lemon and white point r (morgrel) weight 30 pound Dog had been etherized under positive pressure on two days previous Considerable mucus in pharynx doubtless resulting from the above All aseptic precautions of a hospital surgical operation Crescentic incision on right chest with convexity / incl from median line and ends approaching axilla Pectoral muscle fibres cut transversely also pectoral aponeurosis of external oblique Fascia covering ribs incised over and parallel to 5th rib Saw cut through cartilage of 5th rib 1 inch from sternum Another s / cut 1 / inches towards axilla Ribs then carefully dissected from parietal pleur and from its intercostal attachments Intercostal oozing readily stopped with pressure Positive pressure resistance increased to 7 cm (water) by lowering glass tube in water column Pleurotomy (1 inch) Pressure regulated that lungs hurried parietal wall but did not protrude through opening Mediastinum bulging into wound however Reposition quiet and regular Attempt made to reduce resistance to 4-5 cm Respirations became labored 7 cm restored After one half hour of observation pleural stitch commenced No risk fine curved round needle Suture picked up pleural edges together with intercostal stump which by above method of dissection lay in close apposition to pleural edges Ties 3 inch apart At one point however where pleura was devoid of intercostal support a cross tear occurred after continuous stitch was tied Repaired by a cross stitch Still some air leakage Second continuous row of sutures including fascia covering intercostal and picking up pleural stitch prevented further leakage Catgut to muscle layer Pagenstecher's linen to skin

Dog allowed out of ether too soon before staple was applied Considerable unnecessary strain on stitches resulted Under ether hours

July 22 Temperature 102 (normal) pulse 8 irregular respirations 26 Languid

July 24 Temperature 104.4 pulse 54 irregular respirations 20 (normal) Active apparently normal condition

July 25 Stitches removed slight redness in / inch of incision Cotton collodion cocoon

July 27 Cocoon removed wound clean and dry Dog well Temperature 101 Pulse 94 respirations 20

Sept 16 Since last note dog's convalescence has been normal except for diarrhoea and loss of weight following ingestion of stale meat He recovered from this before autopsy The pulse has been irregular since operation

*Autopsy* Sept 16 1907 Dog killed with ether Line of incision clean and distinct Slight fullness at lower end about size of a pea One dram of pus escaped from this point and was traced to a small cavity in muscle layer containing a free chromic gut stitch Muscle union firm and adherent to pleural suture below Pleural scar divided Adhesions from between pleurotomy wound and pericardium (probably explaining irregularity of pulse) Light easily broken adhesions between pleurotomy scar and adjacent surfaces of middle and lower right lobes Lungs

excised and inflated Found to be normal throughout No hemorrhagic, emphysematous or consolidated areas seen macroscopically

CASE VII—Operation *Simple pleuotomy One rib excised* Result *Recovery* Object To repeat operation of Case VI, to improve rib resection and suturing At this time resection of rib seemed to me imperative to obtain room enough to operate on lungs

July 20, 1907 Fox-terrier, male, weight 20 pounds Technique identical with previous operation except that intercostal muscles were carefully preserved and no lateral tears occurred in pleural stitch Dog came out of ether slowly, and when left in recovery room was unable to stand Prognosis looked unfavorable

July 21 Dog lively and active as before operation Milk diet taken eagerly

July 22 No symptoms, solid food

Summary of daily chart

July 22	Temp	102,	pulse	100,	resp	panting with heat	
" 24	"	102.6,	"	120,	"	"	"
" 27	"	102,	"	90,	"	25	
" 29	"	102,	"	105,	"	23	

Skin stitches infected and removed on the 5th day Secondary healing in two weeks

Sept 24 Convalescence has been normal throughout Dog killed with ether

*Autopsy* Right chest opened in 7th intercostal space Finger introduced and pleural surface of original pleuotomy explored Smooth serous covering at this point with no adhesions to pericardium or lungs No fluid in cavity No adhesions between lobes of lungs Layers of thoracic wound firmly cicatrized and free from signs of infection

CASE VIII—Operation *Simple pleuotomy, 2-rib excision* Result *Recovery, after localized empyema* Object To attempt a larger pleural opening before attempting lung resections Sub-periosteal resection attempted, but found difficult with such small structures Attempted two-rib method again

July 21, 1907 French bull bitch (white), weight 20 pounds Grid-iron incision down to level of ribs Fifth and sixth ribs each sawed near costochondral articulation, and again one inch and a half nearer axillary line Both sections together with 5th intercostal muscle group removed, leaving stumps of 4th and 6th intercostal muscles as long as possible A right angle tonsil-knife was successfully used to separate ribs from pleura Sub-periosteal resection of rib not practical in small animals Pleuotomy of one inch Respirations under pressure observed, but pleural cavity not disturbed Mediastinum inclined to puff into wound, especially during forced expirations when ether was "light" Pleural edges alone approximated with provisional mattress stitches later drawn up through pectoral muscle and tied Intercostal stumps could not be stretched across space left by two-rib excision, so pectoral muscle was sutured over pleura Approximation of this layer poor at sternal end Pectoral muscle sutured with interrupted and continuous Pagen-

stecher linen. At completion of suture slight leakage could be heard near axillary stump of 6th rib which had torn open the pleura at this point.

July 22nd Temperature 101.6 pulse 152 respirations 56 Dog somewhat languid

July 3rd Temperature 104 pulse 176 respirations 84. Condition much worse. Respiration labored. Presents all symptoms of pleuritic effusion with probable infection. Presuming that leakage was occurring in wall an attempt was made to expand lung under pressure together with aspiration to empty cavity and favor pleural adhesions. Seven to eight cm (of water) pressure applied with apparatus. Trochar inserted dog's axillary line at 6th interspace. Rubber and glass tube extends on to trochar. Mouth suction. One half ounce of bloody fluid aspirated by this method. Tube suddenly withdrawn and thoracocentesis wound clamped and tied. Lung had thus been expanded by both positive and negative pressure. Animal apparently much revived by above procedure. Ran up three flights to recovery room. Five hours later respirations 64.

July 24th Marked improvement. Temperature 102 pulse 120 respirations 5.

July 5th Marked fluctuating swelling under skin flap. Skin stitches granulated at one point. Three ounces of sero hemorrhagic fluid escaped more than enough to have come from flap alone. Large absorbent dressing applied.

July 6th Dressing soaked. See chart.

July 28th Dog in fine condition. Condition has evidently become one of a localized empyema. Drainage continued. Discharge now purulent.

Sept 15th Sero purulent fluid discharged from wound for five weeks with gradual closure. Dog meanwhile active and eating well.

*Autopsy* October 24, 1907—Dog entirely normal since last note. Few adhesions connect no length of pleural incision with adjacent surface of lower and middle lobes. Middle and lower lobes slightly adherent at their adjacent surfaces. No fluid in cavity. Lungs excised and inflated. Both lungs normal and functional in every respect. Considering seriousness of dog's condition 10 days after operation the pleural cavity showed little signs of previous disturbance.

CASE IX—Operation *Excision of 1/2 inch tip of right middle lobe*. Result *Recovery*. Object Satisfied from above recoveries that simple pleurotomy with excision of piece of one rib was a reliable procedure. It was decided to adhere to this technique of closure and to attempt excisions of lung tissue. There seemed to be reason to believe that fatalities resulting could not be ascribed to the lung excision and not to faulty closures of cavity.

July 22 1907 Tiny mongrel brindle female weight 12 pounds. Absolute aseptic precautions. One and one half inch of 5th rib excised. Pleurotomy. Mediastinum in this case showed no tendency to blow into wound. Tip of middle lobe lying in immediate vicinity seized with smooth forceps and drawn out of wound. Tongue of lobe clamped with curved half length blades protected by rubber tubing. Triangular piece then

amputated  $\frac{1}{8}$  inch from clamp Continuous over-and-over stitch to stump No vessels separately tied Clamp removed Two ends of stitch tied together, making stump conical in shape Circular linen ligature at point of removed clamp This tie yielded suddenly at end of first knot, as though cutting through Pleural stitch satisfactory and strong Excessive (10-12 cm) pressure applied as knot was tied in pleural suture with hope of driving air out of cavity just previous to closure, thus approximating lungs to thorax wall and preventing pneumothorax Silk to muscle layers Pagenstecher linen to skin Binder with firm pressure

July 23rd Dog inactive, but apparently not sick

July 24th Temperature 104, respirations 26, pulse 140, question whether this temperature indicates pleurisy Low respirations point against this possibility Dog lies in corner, and growls when approached

July 25th Temperature 103, pulse 130, respirations 20 Eating well

July 26th Slight leakage of serous fluid at one end of wound, apparently from between layers of wall

July 28th Wound dry and solid Dog lively and well

Sept 26th Remained in absolutely normal condition to time of autopsy Has gained about five pounds in weight

*Autopsy*, Sept 28, 1907—Superficial pus formed between pectoral and intercostal layers Intercostal layer strongly intact Incision made in 7th space Adhesions found between lower lobe and diaphragm, between pericardium and pleural wound, including stump of amputated lobe Adhesions also between upper lobe and posterior thoracic wall, between middle lobe and pericardium There was also a light adhesion between pericardium and left middle lobe Lungs excised and inflated, and found normal throughout A small portion of right middle lobe lacking Stump one inch in diameter Numerous adhesions covering stump Specimens in toto frozen for future reference

CASE X—Operation *Excision one-third of upper lobe* Result *Recovery* Object Dog IX having no threatening symptoms, a more extensive lung excision was attempted

July 25, 1907 Lemon and white fox-terrier, weight 16 pounds Technique of pleurotomy same as in Case IX, with excision of one rib Pleural opening, one inch Five minutes after pleurotomy, dog's respirations became shallow and less frequent Probably due to excess of ether Opening closed by traction on presenting lobe, and respirations were restored to normal Presenting lobe clamped Amputated stump sutured with continuous over and over silk When clamp was released profuse hemorrhage occurred Stump transfixed twice and ligated with Von Brun linen Stump dropped back, and pleura stitched Pectoral muscles well overlapped, making good support of pleural stitch

July 26th Languid Milk diet

July 27th More active Doing better than expected

July 28th Somewhat sluggish Respirations 30 and somewhat labored, but no signs of dyspnoea Possible that respiratory stretching of pectoral muscle caused pain which gave appearance of difficulty in breathing Lameness of right fore-leg more marked than previous cases

July 29th Wound clean stitches removed One drop of serum in one stitch hole. Dog coughs in low voice occasionally

Aug 4th No coughing Hungry for solid food

Aug 11th Discharged well to roof

*Autopsy* Sept. 8 1907 (2 months)—Killed with ether

Muscle and skin in region of incision were removed in one layer and the pleural stitch was found solid. It is evident that there is considerable atrophy of the intercostal muscles in these cases.

An incision was then made two intercostal spaces below that where operative incision was made and the finger introduced upwards to the pleural side of thoracotomy wound and a light adhesion was found between the middle lobe and the pleural scar. The left chest was then opened and the lungs and heart removed in toto including sections of those ribs on the right to which right middle lobe was adherent.

The triangular piece described in account of operation proves to have been taken from a tongue of the upper lobe and the adhesions of the middle lobe was a coincident due to proximity of the same to the pleural opening. In fact the localization of the adhesion point on the parietal anterior surface of the lobe suggests to me that the lung must have been in a normal state of inflation immediately after the operation at a time when such contact adhesions would doubtless be formed.

The stump of the upper lobe is connected by a goose neck adhesion reaching across to the pectoralium. It was really of little apparent significance.

Both lungs inflated normally and it was interesting to compare the two upper lobes when under inflation. The stump of the resected portion of the right upper lobe was not more than a half inch in length although the operation describes autured stump of two inches and a half. On comparison with the opposite lobe however it is evident that the apical tongue of this lobe is lacking thus changing the shape of the parietal surface from pear shape to a more quadrilateral shape with rounding corners.

**CASE XI—Operation** *Excision one half of upper lobe* Result *Recovery* Object Satisfied that apparatus is practical when properly handled also satisfied that technique of wall closure is proving reliable and that aspcsis is improved determined to limit myself to simple pleurotomy with excision of more lung tissue.

July 28 1907 Brown and white mongrel hound weight 25 pounds Technique of thoracotomy unaltered One and one half to two inches of 6th rib excised. A large portion of pre-entire lobe included by clamp. After amputation two rows of continuous linen were employed to stump. Lobe transfixed once proximally to clamp at median point and as clamp was released stump was ligated in both directions. To be noted here that a simple curved half length without rubber protection to blades has been used for clamps in the above operations. Time under positive pressure 2 hours.

July 9th Milk diet taken well.

July 30th Takes solid food greedily



Aug 1st Temperature 102.4, pulse 105, respirations 15 Somewhat inactive and lame, but not sick

Aug 3rd Dressing and stitches entirely removed Drop of pus in one stitch hole at axillary end of incision Dog running about to-day

Aug 8th Wound entirely dry and clean Temperature 102, respirations 20, pulse 75 Aug 11th Discharged well to roof to complete convalescence interval of 8 weeks

Suturing stump and thoracotomy wound consumes an apparently excessive amount of time, but the forced movements of the chest and the fluttering mediastinum, and the occasional interference of the pericardium, render careful approximation with fine needles a slow process Lack of an assistant added to time expended

CASE XII—Operation *Excision of right middle lobe* Result *Recovery Death in four weeks from unknown causes*

July 31, 1907 Brindle Boston terrier mongrel, weight 25 pounds  
Object To increase extent of pneumectomy gradually To attempt total removal of right middle lobe

Gridiron incision Pectoral muscle divided transversely to fibres Pectoral belly of rectus and fascia over ribs cut parallel to and over 5th rib Usual rib excision, saving all intercostal muscle tissue Intercostal arteries required tying in this case Pleurotomy one inch Dog not being susceptible to ether remained "light" throughout the operation As usual in such cases, expirations were violent as though effort was being made to blow away resistance of water column Tendency under such conditions to lung collapse is, of course, much reduced, so that the whole operation was conducted under an actual resistance of only 3 cm of water, which, however, by voluntary forced expiration was increased to 7-8 cm Mediastinum was consequently blown violently into wound in form of finger-cot shaped scar, as result of unequal pressure in two pleural cavities resulting at expiration in the extension of the left lung and mediastinum over to the pneumothorax side The bulging mediastinum was walled away with gauze wick

Tip of lower lobe seized, but found unyielding, and dropped back with laceration of tissue by use of forceps Middle lobe then drawn well out of cavity and clamped as near root as possible with clamp remaining extra-thoracic Stump sutured over-and-over with silk Transfixed proximal to clamp with Pagenstecher linen, and tied in both directions as clamp was released Mediastinal wick removed Respirations now less forced, mediastinum quiet

Satisfactory pleural stitch, including intercostal stumps, and fascia covering them Slight leakage at end of wound showing necessity of carrying stitch to extreme limits of intercostal incision Second row of sutures to same tissues Von Brun linen continuous to muscle, continuous linen stitch to skin Considerable bleeding in wall Time 2 hours

August 1st Apathetic  
 August 2nd Languid but not sick  
 August 3rd Temperature 102 pulse 140 respirations 40 More active Dressing removed  
 August 6th Temperature 102 pulse 150 respirations 28 Wound entirely clean and flat.  
 August 8th Temperature 102 pulse 150 respirations 24.  
 August 12th Discharged well to roof  
 August 26th Dog has been normal and eating well but never active.  
 Question whether dog is naturally lazy

August 7th (4 weeks after operation) Dog found dead on roof with maggots in mucous membrane. Dog fight had been overheard on previous day but there were no superficial signs of violence

August 28th *Aopsy*—Small accumulation of pus in muscle layer with loose linen stitch in its midst Pleural scar solid and clean

Further report by S. B. Wolbach as follows

The right lung is collapsed at the apex compact markedly post mortem. As viewed from behind the middle and lower lobes are adherent to the chest wall to the 3d 4th 5th 6th and 7th ribs. From in front the pericardium and anterior border of the right lung are adherent to the chest wall formed by the 4th 5th and 6th ribs. A portion of the 5th rib is missing and for a distance of 4.5 cm the chest wall is made up of fibrous tissue. On incision a pus cavity is exposed in which lie several sutures. The lower lobe of the left lung is apparently normal.

The heart is united to the pericardium by loose tough fibrous tissue over both ventricles.

Right auricle and ventricle is adherent to the chest wall below the stump of the lung markedly postmortem apparently normal. Tissues about stump of lung firm and clean.

**CASE VIII**—Operation *Excision of 3 right lobes* Result *Death*  
 Cause *Infection of both pleural cavities*

Aug. 1907 Tan colored bull bitch weight 24 pounds. Object Excisions of individual lobes and parts thereof have been so persistently successful in the last few operations that more radical procedures seemed possible. Instead of gradually increasing the amounts excised total excision of lobes was attempted.

Same thoracotomy technique with excision of piece of fifth rib. Animal employing forced expiration owing to unsusceptibility to ether causing hernia of mediastinum. At one stage it was necessary to suspend operation and plug wound with gauze at same time lowering pressure resistance to 3 cm on account of the forced expiratory movements.

Middle and upper lobes consecutively withdrawn from thorax, clamped amputated sutured and transfixed at stump. No vessels or bronchus tied separately. Ends of continuous sutures to stumps tied together.

Lower lobe treated likewise except that two vessels were ligated before stump was sutured. Finger exploration revealed no palpable lung tissue remaining. During pleural stretch pericardium constantly flapping

into wound Pierced twice by needle Respiration at same rate after pneumectomy until dressing was applied and pressure removed At this moment breathing became more rapid Time 2 hours, 30 minutes

August 3rd Temperature 102.6, pulse 135, respirations 88 Dog's general appearance no different than in animals with partial pneumectomy on first day after operation, except for high respirations Temperature seems to contraindicate sepsis

August 4th Temperature 102, pulse 110, respirations 65 Sluggish condition, but inclined to walk and join other dogs

August 6th Temperature 101.6, pulse 165, respirations 60 Sick Respirations high and labored Right chest dull to percussion Dog placed on board Trochar inserted into 5th space, axillary line, 175cc of hemorrhagic fluid escaped Stringy sediment at bottom of graduate (culture) Puncture wound closed with stitch On standing fluid leaked through to dressing

August 7th Has refused nourishment for 2 days Considerable improvement in general condition Temperature 101.8, pulse 128, respirations 84 Drainage has ceased Dog found dead at 2 P.M.

*Autopsy* (Wolbach)—"Skin incision perfectly healed There is a small abscess containing about 3 cc of pus A piece of the 5th rib is missing The excised portion of rib is about 4 cm in length There is a stump attached to the sternum about 1.5 cm in length The pleura of the lung is adherent to the pleura covering The left lung above is adherent to the chest wall along the 4th rib Below the lung is adherent to the 6th rib On removal of the lungs a cavity containing pus is found between the lower lobe and the diaphragm Holds in all about 50 cc The adhesions of the lung to the chest wall are firm and fibrous in character A portion of the middle lobe is missing Vessels and bronchi leading to excised portions are normal Both lungs in general are collapsed, deep red and atelectatic"

CASE XIV—Operation *Pleurotomy with 3-rib flap* Result *Death*  
Cause *Lung collapse from leakage*

Aug 4, 1907 Fox-terrier-beagle mongrel, weight 28 pounds Object Realizing that pleural opening in the above cases is too small for intrathoracic operating in general, a departure from the above technique of pleurotomy was undertaken in the form of a rib flap Apparatus worked satisfactorily, and no breaks in asepsis were detected

Semi-circular skin-flap exposing 4th, 5th and 6th ribs for distance of 2 inches Gridiron incision through pectoral and upper rectus origin Cartilages of 4th and 5th ribs cut through Bony portions sawed through 2 inches from cartilage cuts Intercostal muscles of 3rd and 6th spaces cut at attachment to 4th and 5th ribs respectively Tonsil knife used to separate rib flap from parietal pleura Pin point punctures near axillary upper end of flap Flap now bent back towards axilla, exposing pleura to extent of area 1½ inches square Pleura incision across diagonally to direction of ribs Each lobe of right lung withdrawn in turn and handled Respiratory movements continued rhythmically Pressure so regulated that lung was constantly lying flush with wound but not protruding

Pleura stitched with continuous silk from either end plus two interrupted in the middle. Lack of muscle support to pleural edges resulted in lateral tears at two points which could not be permanently repaired. Considerable air leakage in and out of cavity. Flap layed over and adjoining tissues at edge of flap stitched with linen. Ends of ribs and cartilages joined with mattress stitches taking in cartilage or periosteum. Recut stumps could not be brought together across space. Pectoral was sutured carefully however and leakage could not be heard. Second continuous row in pectoral layer. Skin brought to close approximation with interrupted and continuous linen. Dog out of ether and walking to leash in 30 minutes.

Aug 6 1907 Refused nourishment. Expirations forced and characteristic of all above cases with effusion and collapsed lung. Identical also with breathing of Case XIII in which there had been practically a total pneumectomy. Temperature 102.6 pulse 150 respirations 60. Temperature seems to indicate septic pleurisy.

Aug 7 1907 Found dead in recovery room at 9:30 A.M.

*Autopsy* (immediately).—Skin stitch tight and dry. Immediately beneath was found direct communication with pleural cavity. Pectoral suture was intact but axillary end of pleural stitch where protected only by outer edge of rectus was wide open. Directly beneath skin therefore an effusion was encountered which proved to fill the right thoracic cavity. This effusion was fibrinous in character. Both rib segments contained in flap had broken away from their sutures. Intercostal muscles of flap showed beginning of gangrene doubtless from lack of blood supply due to injury to intercostal vessels. The parietal pleura was adherent to the collapsed right lung and dragged with the latter to the posterior wall. Lobes were all atelectatic.

**CASE XV.—Operation.** Excision of  $\frac{3}{4}$  of right middle lobe. Result. *Recovery.* Object. Two departures have been made in the last two cases from a previously satisfactory procedure. First excision of four times as much lung tissue. Case XIII and attempt at rib flap in place of single rib excision. Since both operations having resulted fatally it was decided to return to the original technique with more gradual increase of procedure.

August 9 1907 French bull terrier weight 8 kilos. Original technique of pleurotomy with excision of two inches of 5th rib. Tip of presenting lobe seized. Lobe drawn out. Amputated. Stump suture. Transfixation and ligation. Pleural stitch leaked at one point. No leakage though in muscle layer. Pectoral suture not diagonal to pleural stitch.

Aug 10th Dog very apathetic lying down head low. Purulent discharge from both nostrils.

Aug 11th Refuses nourishment pus discharge from eyes and nose. Respiration 18 temperature 10 pulse 100 irregular.

Aug 12th Water ounces 3 by rectum. Dog sick, but respirations are normal. Suspected that lameness was due to rhinitis and conjunctivitis.

Aug 16 Walking about. Less apathetic. Eating well.

Aug 19th Dressing disturbed for first time Continuous stitch surrounded with lymph, removed This condition of skin stitch likely to occur if latter is left in more than four days Dressing omitted

Aug 20th Scabs of sawdust over stitch wound of aid in healing

Aug 24th Snuffles more active Diarrhœa profuse Eating well, however Pulse still ranging between 125 and 150 Temperature and respirations normal Diagnosis, distemper

Sept 6th Discharges less No rash has developed

Sept 15th No symptoms of distemper Dog entirely well Gaining weight

Oct 13th Dog has developed no symptoms of any sort

*Autopsy* (9 weeks)—Thoracotomy wound clean and solid Adhesions between right lower lobe and lower end of pleurotomy scar Adhesion between stump of middle lobe and the pericardium Also between stump and pleurotomy wound Found that one-half of cardiac (middle) lobe has been removed A small cyst the size of a pea bean was found in stump which contained a gelatinous fluid and which, when incised, allowed escape of air through pin point opening

Right lung tissue presents microscopically no areas of atelectasis, pneumonia or emphysema Left lung normal Both lungs excised and inflated Sketch made Specimens frozen 12 hours after removal

CASE XVI—Operation *Excision right middle lobe* Result *Recovery* Object To further establish the reliability of the above method of pleurotomy and partial pneumectomy

Aug 10, 1907 Irish terrier, weight 11 kilos Well nourished, short hair Rib excised without injury of pleura at any point Pleurotomy of 1½ inches Respirations continued to be regular and not dyspnoeic Neighboring lobe withdrawn and amputated Stump too long for "half length," resulting in slight wrinkling Same suture to stump except that continuous was carried across and back Stump transfixed and ligated

Wall layers as follows 1 Pleura and internal intercostal No leakage after this suture 2 External intercostal and fascia 3 Pectoral and few cut fibres of external oblique Apparatus satisfactory Pulse 180 at end of operation Temperature subnormal, 100.4 Respirations 60 Technique interrupted twice 1 Cleaning mucus from cone 2 Refilling ether bottle Operation on whole more satisfactory than those above

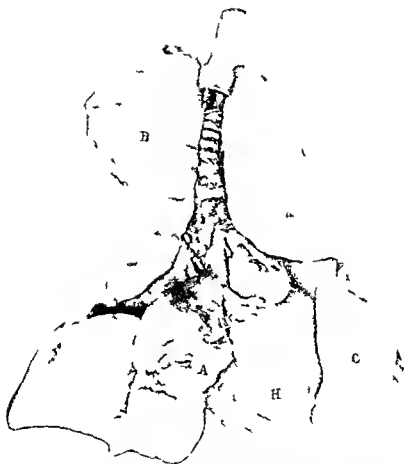
Aug 11th Solid food Walking Temperature 103.2, pulse 130, respirations 30 Prognosis good

Aug 12th Pulse irregular (See autopsy for pericardial adhesions)

Aug 15th Stitches out, wound clean (See chart of Case XVI)

Oct 10th Eight weeks since operation Dog has had an uninterrupted convalescence

*Autopsy*—Thoracotomy below original scar Finger introduced and the under surface of pleurotomy wound palpated It was covered with serous membrane and there were no adhesions except one to the pericardium, which was easily separated The lungs were excised in toto and



C XVI-E      f right middl l b (A) St mp l ed l be (B) R ght ppe  
l be (C) L. ft middl l be (H) Heart



inflated After separating adhesions between stumps and adjoining surfaces of upper and lower lobes it was found that all but a small portion of the right middle lobe had been excised Specimen frozen Thawed out inflated and photographed five weeks later The lungs and pleural cavity were otherwise entirely normal

CASE XVII—Operation *Posterior thoracotomy* Result *Recovery* Object It was evident that full traction on middle lobe through small anterior thoracotomy wound did not render root of this lobe extra thoracic In other words amputation of a lobe by anterior approach with small opening did not remove all of the lung tissue of that lobe A posterior attack was undertaken Simple thoracotomy for technique was first attempted

Aug 24 1907 Brindle pup long ears long legs weight 4 pounds Dog etherized on back then turned to prone position on board Cone and apparatus adjusted readily by placing chin rest under lower jaw Shaving of coarse hair of back more difficult Preparation otherwise the same Semicircular flap as near scapula as possible exposing muscle over second and third ribs Muscle external to erector spinae group (corresponding to trapezius and latissimus fibres) divided transversely Rib excised as in ventral operation Wound sutured in layers by usual gridiron method

Aug 15 Condition good Appeared normal in all respects Respirations 30

Aug 20 Chart normal Temperature 101 pulse 100 respirations 20

Aug 2 Skin stitch parted for distance of 1/2 inches No infection Secondary suture with wick remaining

Aug 27 Secondary skin suture suppurating but considerable gain has resulted from attempt

Sept 2 Distemper symptoms Dog in room previously occupied by Case XV with distemper Food taken well Pus from eyes and nose Diarrhoea

Sept 19 Fell out of story window and broke femur of right hind leg Swelling appeared under operation flap

Sept 21 Five weeks since operation Dog killed with ether on account of broken leg

*Autopsy*—One ounce of sero hemorrhagic fluid allowed to escape from under skin flaps Focus of origin traced down to pocket between intercostal and pectoral muscle layers Finger introduced in 5th intercostal space and both internal and external surfaces of pleurotomy wound examined bimanually There were no adhesions on pleural surfaces and the pleurotomy scar was still pale in color with silk stitch enclosed in cicatrix Both lungs and pleural cavities normal

CASE XVIII—Operation *Dorsal pleurotomy and pneumectomy of left lower lobe* Result *Death* Object Dorsal thoracotomy evidently successful Object to try dorsal approach to lung root

Aug 15 1907 Bull terrier bitch (black and white) weight 18 pounds Technique of thoracotomy the same Lower left lobe withdrawn from cavity with difficulty owing to the large presenting posterior surface



which was with difficulty dragged backward through opening No gain in extra thoracic approach to root Lobe could not be withdrawn far enough to apply clamp extra thoracically to the main vessel trunks This might have been possible through a large pleural opening Clamp applied one inch from hilum Lobe amputated Two large orifices in stump tied separately (probably artery and bronchus) Continuous to stump followed by transfixation and ligature proximal to clamp Considerable difficulty in closing stump even with two rows of sutures

Aug 15 Apathetic Pulse 160, respirations 36

Aug 16 Refuses milk and solid food

Aug 17 Temperature 103.4, pulse 150, respirations 48

Aug 19 Slight dullness of operated chest Temperature 103.2, pulse 178, respirations 35 Lying down and lacks energy to shake flies from head and nostrils, from which there is a profuse purulent discharge, somewhat more marked on left side

Aug 21 Dullness of left chest approaching flatness Skin wound clean, dry and flat Dog placed on board Etherized One-half inch of 7th rib excised Finger introduced Lung found retracted over all pleural surfaces Vacuum pump connected with glass funnel, which was placed over wound snug to skin Probably about six to eight ounces of hemorrhagic purulent fluid sucked into conduit Water introduced and sucked out again repeatedly Two drainage tubes inserted and pinned into place Evidently dog was suffering from general pleuritis of left cavity, although right lung seemed to be doing sufficient work by an increase of respiratory movements The pneumothorax now produced was no added evil, in so much as the lung was found already retracted and adherent Mediastinum was also thickened and more stationary

Aug 24 Dog lived 3 days after drainage, but condition did not improve Pulse remained over 160, and it was of interest to note that temperature was normal on day of drainage

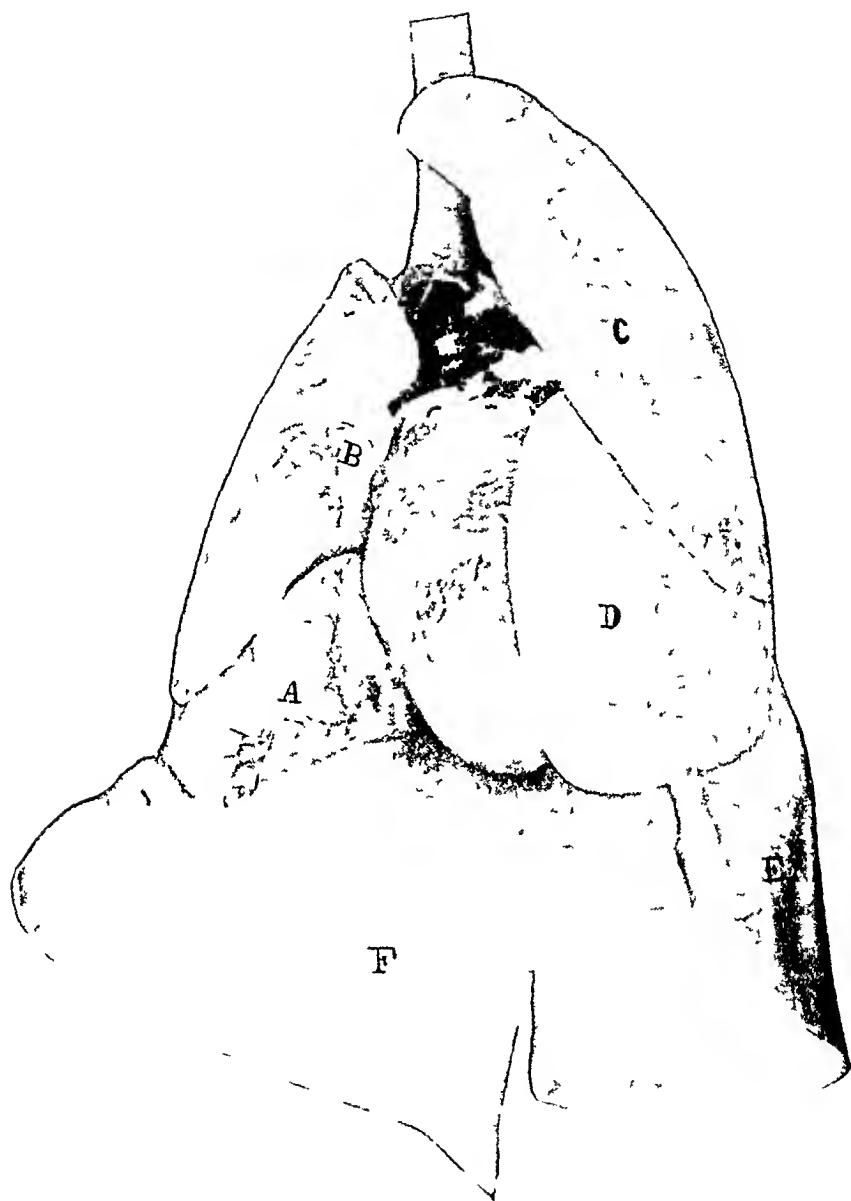
Died Placed in cold storage to await autopsy By mistake of janitor this animal was destroyed before autopsy Judging from findings in similar cases, it is probable that the unopened chest was also infected, and death was due to infection of both pleural cavities

CASE XIX—Operation *Anterior thoracotomy, excision of right middle lobe* Result *Recovery* Object Evident that with a larger pleural opening as much can be accomplished extra thoracically by anterior as by posterior approach It is also possible thus to avoid the difficult skin preparation, the turning over of the animal, the less adapted musculature, and the difficult withdrawal of the lobes, from the base, rather than the apex of a cone, as it were

An attempt was also made in this experiment to reduce the air-leakage through the pleural opening during the stump suture The object in this being to, first, reduce the loss of body heat which is ever present in the sucking in and out of outside air into the pleural cavity, second, to lessen also the chance of infectious particles being sucked into the cavity at the same time, third, to diminish the amount of positive pressure necessary to prevent collapse, in other words, to avoid pneu-



C XIX-E right m ddi 1 be (A) St mp



CASE XX —Excision of one-half of right upper and middle lobes (A) Stump of middle lobe (B) Stump of upper lobe (C) Left upper lobe (D) Left middle lobe (E) Left lower lobe (F) Diaphragmatic surface of lower lobes

mothorax as nearly as possible without the help of the apparatus fourth to diminish the fluttering tendency of the mediastinum towards the opened side at expiration and thus to avoid injury to the latter

Simple packing of gauze around the clamp owing to the constant movements of the ribs is not only difficult to maintain but at the same time permeable A stump controller to be later described served the above purpose admirably and offered the additional advantage of holding the stump and clamp in fixed position thus making a more careful approximation of pleural edges in the stump suture

It was also concluded that picking up and tying of all passages and blood vessels in the stump might if followed by accurate closure avoid the necessity of transfixation

Aug 6 1907 Black and white bull dog weight 22/ pounds

Original technique of thoracotomy with excision of 2 inches of 5th rib Middle lobe drawn out to full traction Clamp applied Stump controller applied gauze packed tight between its under surface and the pleural opening

Every visible opening in stump snapped and tied with Von Brunlens Two rows of linen to stump First row deep second to pleura only Clamp released gradually No oozing or leakage from stump Wall suture gave satisfactory approximation

To be noted here that during two thirds of this operation animal was breathing against only 1-2 cm of water resistance as a result of the reduced pleural opening

Aug 2 No apparent change in dog's condition Appears and acts as before operation Solid food taken ravenously Temperature 100 pulse 115 respirations 28

Aug 25 No change

Aug 31 Stitches removed wound clean and dry

Sept 5 No symptoms have developed Chart has remained normal

Sept. 30 Dog has developed mange which causes no symptoms but loss of weight.

Oct 20 Since last note dog has continued well with exception of intercurrent mange

*Autopsy* Oct. 20—Dog killed with ether One light adhesion between middle lobe stump and pleurotomy wound Adhesions in immediate vicinity of stump readily separated Pleural cavities both normal Lung tissues apparently normal Lungs and heart excised inflated and photographed

**CASE XX—Operation** *Anterior excision of one half upper and middle lobes* Result *Recovery* Object Satisfied that anterior technique is perfected and necessary in amputation of middle lobe attempted more extensive pneumectomy

Aug 5 1907 Airdale terrier mongrel Long hair removed. Increased chance of sepsis from neighborhood of prepared area. Normal method of entrance. Pectorals cut more tangentially to line of ribs increasing gridiron arrangement. Middle lobe drawn well out of wound and clamped Controller applied Amputation. Bronchus and vessels

in immediate vicinity in stump ligated in single tie Continuous to and fro linen stump stitch No transfixation or ligation of stump Upper lobe withdrawn to half its extent and treated in identical manner Very slight bloody ooze in region of stumps when dropped back A tear occurred in first row of pleural stitch, which was closed by second row

During operation 2-3 cm (water) pressure sufficient to maintain rhythmical respiration during treatment of stumps Animal kept light under ether Time 2 hours Aug 26 dog not visited

Aug 28 Condition excellent Temperature 102, pulse 126, respirations 35 Hot day accounts for rapid respiration, which is not labored Prognosis is good As in question of peritonitis, third day seems to settle prognosis Dog presents none of serious symptoms which fatalities without exception have manifested on the third day

Sept 5th Prognosis of last note proved correct Eating well Active

Sept 12th Stitch, left in as experiment, was not aseptic Removed

Oct 25th Since last note this dog has been normal in appearance, habits and actions On several occasions he was heard to give a low cough

*Autopsy* (lapse of eight weeks since operation) —Killed with ether No adhesions at any point between visceral and parietal pleurae Light adhesions between stumps of middle and upper lobes Half of each of these two lobes found lacking Heart and lungs excised in toto, and frozen Four weeks later inflated and photographed as in photograph (C)

It will be noted from the above that of 15 cases, including six simple anterior thoracotomies and 9 excisions of portions of lung tissue, Cases I and V were the only fatalities It is fair to explain these two deaths on the basis of undeveloped asepsis and technique existing at the beginning of this series of operations

On September first, in view of the low mortality, I had become entirely confident of being able to do simple thoracotomy with surety of recovery I was sure also of recovery after excision of either upper or middle lobes, or portions of either or both

Departures from the one-rib-excision technique had not been successful The only case of lower lobe excision had ended fatally, although it was done by the less perfected posterior approach The only attempt made in a three-lobe excision had also resulted in death

The number of recoveries after thoracotomies and moderate excisions convinced me that these fatalities were due

neither to serious influences of the positive pressure method nor to the existence of pneumothorax at the end of the operation inasmuch as these factors had they not been successfully avoided would likewise have caused death in a majority of the above recoveries. The history of the surgery of the lung reveals rare isolated cases of total extirpation of one normal lung without thoracoplasty with recovery. We also recognize clinically that numerous cases are known to have lived a number of years with only a small portion of the total lung volume remaining functional. It is therefore to be presupposed that the above fatalities and those of extensive resections which may later occur cannot be explained on the basis of the loss of aerating lung tissue.

As regards sepsis it must be admitted that in more extensive lung resections there is greater opportunity for infection because such operations are of longer duration thus favoring the entrance of sepsis from the normal channels such as instrumentation sucking in of infectious air particles and prolonged exposure of the lung stump. On the other hand the above sequence of 14 cases (VI-XX) with only three deaths two of which were the two cases above referred to that of excision of lower lobe and that of total extirpation leads me to infer that my aseptic technique is reasonably reliable in animal experimentation and that the explanation of sepsis in these two cases and also in those which may later follow of extensive resections must be found in one of the following factors

- 1 The improper closure of the stump with leakage of infectious material

- 2 Insufficient closure of stump leading to escape of air resulting in pneumothorax and collapse which were not present at the end of operation

- 3 Perhaps to the establishment of a definite cavity which may be filled either by granulations or compensatory emphysematous displacement of the remaining lobes

CASE XXI—Operation *Excision of right lower lobe* Result *Death in three days* Cause *Sepsis pneumothorax from leakage of*

*stump* Object To attempt a series of more extensive lung resections

Sept 1st, 1907 Brown and gray mongrel One rib thoracotomy Lower lobe withdrawn to limit of traction Clamp (unprotected) applied extra-thoracic Amputation All vessels and bronchioles in stump tied separately Same used to pick up each vessel in sequence Attempt then made to concave lung stump with use of thermo-cautery (Necessary break in asepsis here, after which hands were hastily passed through sterile water and alcohol) Object of concaving stump was to allow better approximation of pleural edges with possibility of inversion First row of linen continuous to stump included the latter, a second row of continuous taken deeper and needle was felt to pierce the linen ligatures in the stump When stump was dropped back after removal of controller, there was a tendency to dyspnoëic breathing which was at once relieved by placing palm of hand over wound until normal rhythmic respirations were restored

Gridiron suture of thorax wall same as in recent cases described The pleura-intercostal layer was not tight, however, owing to diagonal tears at ends of the wound caused by withdrawal of large lower lobe through an insufficient pleurotomy incision The pectoral muscle layer, however, seemed to render closure hermetical

Sept 2 Chart starts poorly Temperature 104, pulse 163 Languid

Sept 3 Weakness suggested by tottering gait, pulse 170, respirations 38, temperature 102.6, prognosis poor

Sept 4 Dog found dead at 9.30 A.M. Died some time during night, but rigor was not well marked

*Autopsy* at 11 A.M.—All layers of wall apparently undisturbed Beginning healing Three ounces of sero-hemorrhagic fluid in left side Left lung normal in structure Right lung upper and middle lobes somewhat atelectatic, and covered with fibrinous exudate Stump of lower lobe found buried in lymph and fibrin Suture in place, but pleural edges were everted On inflation air escaped through an opening in stump  $\frac{1}{8}$  inch in diameter When stump suture was removed, stump lay open again to boat-shape produced by cautery At bottom of boat was an accumulation of pus

*Conclusions*—Septic fibrinous pleurisy I believe that suppuration came either by introduced bacteria or by infection from the lung stump (which is suggested by the buried pus below the line of suture), which led to sloughing of the stump and liberation of ligated air vessels, and consequent pneumothorax and collapse of lung

CASE XXII—Operation *Excision of three right lobes* Result *Death in 5 days* Cause *Septic pleurisy, pneumothorax* Object To attempt removal of three lobes

Sept 2, 1907 Fox-terrier, brown and white, weight 21 pounds Not known at the time that result of Case XXI was to be fatal Apparatus fairly satisfactory, but pressure seemed insufficient when pleural opening was unoccupied Middle lobe amputated as usual, except that boat-shape of stump was this time produced with scissors, previous to tying off vessel openings Excessive traction on clamp caused lateral

tear in lung tissue proximal to clamp (not closed) Lower lobe clamped transversely to wound and controller well packed with gauze Five minutes later on looking into cavity air could be seen bubbling through small accumulation of blood around stumps Leakage evident but trusted to clotting and adhesions to stop it. Upper lobe amputated and concaved with thermo cautery

Sponge used to pack off mediastinum removed and found soaked with blood Mediastinum presented very slight tear Pleura torn towards axillary rib stump First row of sutures however rendered wound solid Temperature after operation 96 Afternoon of operation dog normal and active.

Sept. 3rd Dressing had been scratched off Clean one applied Chart good Temperature 102 pulse 122 respirations 20

Sept 4th Dog wags tail but disinclined to stand Took 3 ounces of milk.

Sept 5th Condition worse Languid Respirations short more rapid with slight grunt at end of a forced expiration Temperature 103.6 pulse 150 respirations 38

Sept 6th Respirations more labored Right chest dull with areas of flatness Animal placed on board Opening made through centre of flap Pus encountered at once under skin with free opening below to pleural cavity Vacuum pump with funnel attachment applied airtightly over wound. Hemorrhagic fluid loaded with fibrin sucked away to amount of perhaps six ounces Meanwhile dog under positive pressure apparatus to aid in the expansion of the sound lung by preventing the distention of the mediastinum towards the unopened sound chest Breathing seemed more regular and less labored with help of this combined positive and negative pressure action Continued for one half hour Drainage tube introduced and attached close Gauze dressing and rubber dam superposed with hope of obtaining the suction claimed for the A. T. Cabot empyema dressing Hair over skin surrounding wound prevented the airtight approximation of rubber to skin thus ruining the purpose of the dressing Swathe applied snugly for 1½ hours No improvement in condition Placed on table again Suction applied 20 minutes object to support the mediastinum and prevent limited expansion of the sound lung Then suction and positive pressure both for 1½ hours Dog considerably weakened by this manipulation Sat up to ease respiratory movements but weakness would cause him to fall again

Sept 7th Dog found dead following morning having been two days in special laboratory cage with flannel blanket covering swathe to increase body heat

*Autopsy*—Very little fluid remaining in right chest Right lung stump collapsed and covered by homogeneous flat surface of thick fibrinous exudate which extended from the lung root to the pericardium and mediastinum making these several structures scarcely distinguishable On inflating lungs no leakage was detected from any of the three stumps although it is quite possible that this was prevented by the adherent exudate.



CASE XXIII—Operation *Intercostal pleuotomy* Result *Recovery*  
Object To test the technique of opening cavity without rib excision, as recommended by Miculicz with use of a rib-spreader

Sept 2, 1907 White fox-terrier Gridiron incision as pictured in drawing II Spreader used in mastoid operations utilized as shown in drawing III Ample room thus obtained for excisions Lung not disturbed Wall suture in layers

Sept 3 Condition excellent

Sept 10 No change in condition

CASE XXIV—Operation *Excision of three lobes (right)* Result *Death* Cause *Pleuritic effusion Collapse of lung* Object The fate of Cases XXI and XXII was not concluded when this operation was attempted Had it been so another lower lobe excision would have been attempted previous to this total extirpation The main object of the operation was to test the suitability of an intercostal pleurotomy without rib excision, for the extra-thoracic removal of one or all lobes of the lung

Sept 3, 1907 Large black and white bitch, weight 20 pounds The skin incision was made in the form of a long tongue shaped flap with apex near median line over the 5th intercostal space Muscles and fascia over intercostals divided Intercostals divided midway in line parallel with curve of ribs Pleura and intercostal fascia in same line Ribs then separated by means of a spreader as shown in drawing II With latter in place, respirations became somewhat labored until pressure was raised to 8 cm (water) Less was required, however, when opening was occupied by extracted lobes with packing of gauze

Upper and middle lobes withdrawn, and removed as in the previous operation Tying of numerous separate openings in stumps was rather unsatisfactory, and the need of an assistant was most evident Difficulty met in removing lower lobe, not from lack of spread in thorax opening, but rather in deficient length of incision Resistance to pressure side-tracked in apparatus allowing momentary collapse, and thus enabling easy withdrawal of lower lobe which was clamped as near hilum as possible The time required for careful treatment of stump was not thought advisable, and a chance was taken on single ligature, with three strands of fine Von Brun linen (a most unsuitable material for such purpose) When stump was dropped back, fresh blood was seen coming from cavity Inspection of lower lobe stump revealed no leakage, however Fingers introduced to base of cavity, where blood clots were found Preferred not to exert traction again on upper stumps, so clotting and absorption were relied upon, inasmuch as there was little possibility that bleeding was from main trunks

Pleural stitch satisfactory, although it was difficult to pick up the retracted pleura from under the intercostal stumps, as stitch approached completion

Sept 4th Dog apathetic Hacking cough at times Chart fairly satisfactory Temperature 100.6, subnormal, pulse 135, respirations 34

Sept 5th Respiration higher (48) Food taken reluctantly

Sept. 6th Lying down Prognosis poor Right chest flat to percussion Respirations 60 temperature 104 pulse 120 No food taken to day

Sept 8th Entered recovery room to see the dog take last three breaths

*Autopsy* 30 minutes later—Skin wound covered with thin layer of dried blood Muscle apposition solid and union commenced Positive pressure apparatus applied and water sprinkled over wound There was no bubbling of air through the latter In removal of right chest wall numerous transparent adhesions were found spanning from parietal pleura to root of lung namely to the lobe stumps There were similar bridges to the diaphragm Right pleural cavity completely filled with hemorrhagic fluid at bottom of which were no free clots or sediment (Culture.) This fluid contained no fibrin or pus and was evidently transudate Left chest opened Left lung normal No blood or fluid in left cavity

Thoracic contents excised in toto On examination of remainder of right lung it was found that all had been removed with exception of a quadrangle shaped fragment evidently the stump of the upper lobe which was dark purple in color but covered by shiny serous coat. The pleural edges had evidently been successfully inserted but the sub-pleural hemorrhagic condition indicated incomplete tying of vessels in the stump which may have been responsible for the ooze during remainder of operation The stump of lower lobe which had been ligated only was covered by a dark blood clot The ligature was in place and not perceptibly loosened Under pressure greater than required for the complete inflation of the sound remaining lung an escape of air was detected at pinpoint opening in the ligated stump The heart was apparently not displaced

CASE XXV—Operation *Excision of right lower lobe* Result *Death*  
Object Removal of upper lobes has been successful Removal of all lobes has been fatal Question arose then whether the removal of lower lobe was responsible for death

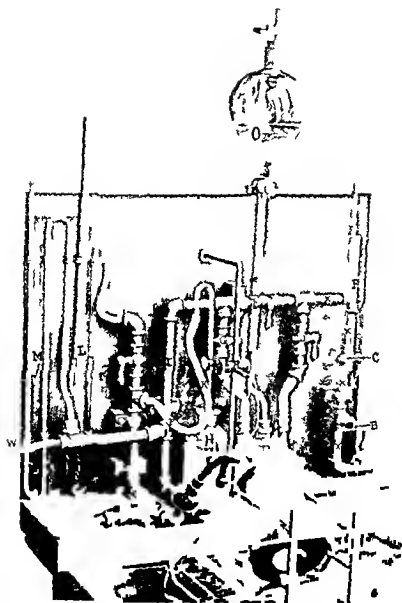
Sept 10 1907 Fox terrier bull terrier mongrel Right intercostal pleurotomy Spreader introduced Lower lobe clamped and amputated. Stump concaved Vessels and bronchioles tied with especial care. Braided pedicle silk then placed proximal to clamp and drawn tight. At this moment a joint in a rubber tubing air conduit parted before second knot of ligature was taken Stump dropped back and gauze stuffed into wound Respirations immediately became labored and intermittent Tubing repaired with difficulty but in time to prevent death. Stump withdrawn again for second knot in ligature. Wall sutures applied as usual Rectal temperature at end of operation below 96.

Sept. 10 11 A.M. Dog found dead still warm *Autopsy* one hour later Wall sutures solid and clean Right chest as half full of sero-hemorrhagic fluid (culture on blood serum) Lower lobe found to have three lobules one of which only was removed. Adhesions between stump and diaphragm. Lower lobe stump bulging at centre but there was no

leakage under inflation All remaining lobes of right lung normal No  
atalectatic areas Left lung normal No fluid in left chest

Cases XIII, XVIII, XXI, XXIV and XXV constitute a group of fatalities which should be considered together In three of these cases a lower lobe was removed In three other all of the right lobes were removed What was the cause of death in these cases? I am tempted, at the outset, to exclude the use of positive pressure apparatus as the cause of fatality, and to credit deaths to the existence of a permanent cavity remaining in the right chest after operation Even in the presence of sepsis, which existed without question in three of these cases, the principal cause of death was undoubtedly the effect of the presence of a cavity in which the air pressure did not equalize that of the unopened side of the chest Such a difference must necessarily lead to the deviation of the mediastinum towards the remaining lung during inspiration and away from it at expiration Such movements must hamper the excursion of the remaining lung, and restrict its oxygenation The persistence of this undoubtedly causes circulatory disturbances by its effect on the right heart Just what these disturbances are will be discussed in a later paper The postmortem cultures taken in these cases were not under strictly aseptic precautions, and I have excluded them in the case reports The operations were done under the same aseptic procedures The increased possibility of sepsis caused by the increased length of operation, and added exposure of the lung stumps, are not sufficiently important factors to explain the cause of death in this group of cases, especially since the previous operations, with one or two exceptions, were absolutely free from pleural infection

With a further desire to practically test this question, renewed efforts were made to exclude all chances of infection, and to rule out any possibility of leakage through the lung stumps which will of course produce pneumothorax, with resulting compression of the sound lung



P RA A-E t p es ppara



## DESCRIPTION OF APPARATUS

The glass cone (N) with a rubber drum over the base is placed over dog's face the drum causing air tight closure just forward over the eyes. Thus any possibility of constriction around the neck is avoided. The cone is held in position by side straps as shown in photograph. Compressed air enters the apparatus at A. With pet cock B opened and cock C closed manometer P is read. Experience teaches how much pressure with vent B open is suitable before leading air through apparatus. Cock C is now opened and B closed. Air passes along conduit X X X. With cocks adjusted as in photograph air passes through D into ether bottle E and out again through G. By pipes I I I it enters cone and at inspiration passes into lungs. Dog's snout fills up most of cone so that small dead space exists and exhaled air passes immediately through efferent conduit K K, K to water column H. By raising or lowering clamp R on upright rod the resistance to pressure is varied. Such resistance is indicated in water manometer L and mercury manometer M. Previous to pleurotomy pressure may be avoided without shutting off or side tracking air compression by opening cock which allows almost immediate exhaust to exhaled air. Through cock to the vacuum the resistance is recorded through glass conduit to foot of table where it connects with tambour and is recorded on revolving drum. Tubing (W) is connected with oxygen tank which on closure of cocks F and G substitutes oxygen for compressed air and manometer M gives reading of oxygen pressure.

From reservoir O ether may be added at any time to bottle E with cock F open and D and G closed.

If more air is desired for dilution of ether vapor cocks F D and G are left open. If air alone is desired F is left open and D and G closed. At point J may be seen piece of rubber tubing slipped over cock such as are bolted with instruments and placed over cocks B C, F G D and J just previous to incision so that operator can control apparatus without breaking asepsis.

CASE XXVI—Operation *Excision right lower lobe* Result *Recovery* Object With renewed possibility of asepsis of perfected apparatus another lower lobe excision attempted.

Sept. 15 1907 Black pointed nose mongrel weight 3 pounds Long tongue shaped skin flap with apex one inch from median line base in axilla Fifth intercostal space incised three inches Lower lobe readily withdrawn through this incised opening. Technique improved by use of Doyen clamp with blades protected with rubber tubing (see drawing IV). With this long clamp transverse to ribs with gauze packing around stump immobilization was accomplished without use of stump controller. Stump treated with greatest possible care. Concaved to boat shape. All vessels searched out and tied. New technique of closure employed as described in drawing (V). Inversion of pleural edges by the Lembert suture most satisfactory. In every previous case lung tissue has presented along suture line between staples. Stump dropped back with no oozing of stump on removal of clamp. In pleuro

intercostal continuous linen stitch, all turns were taken before any one was drawn tight, thus allowing the natural gaping of the wound to persist until needle work was complete. In this way pleural edges could be clearly seen and picked up at each turn. Two sutures were used, each beginning at either end of wound and working toward the centre. When placed the turns of one stitch were taken up consecutively, and tied. Those of the second stitch were similarly taken up, beginning at the end of the wound and working towards the centre. The latter stitch was not tied until an excessive resistance to pressure had been applied at end of expiration, thus evacuating as much air as possible from the pleural cavity before final closure was secured. No vessels in the thoracic wall were tied in this case. Continuous over and over linen stitch to skin. Quick recovery from ether, with no respiratory disturbances.

Sept 16 Somewhat subdued, but wagging tail and able to jump down from bench. Temperature 101.6, pulse 140, respirations 30-40.

Sept 17 Respirations panting, due to heat of day.

Sept 20 Accumulation of fluid under skin flap led me to fear that there was connection with pleuritic effusion. Chest aspirated in axillary line, and suction employed, but no fluid was obtained. It was evident that motion had occurred between muscle layers, allowing, as in all such cases, an accumulation of fluid outside the fascia. This was allowed to escape from under the flap.

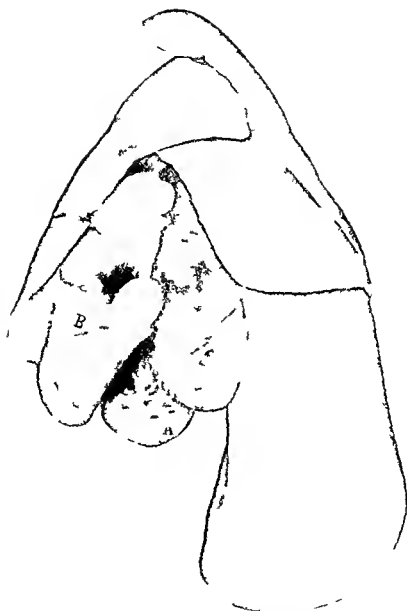
Sept 24 Dog entirely well. Stitches all out. Active and eating well. Shows no evidence of operation.

Oct 25 Well since last note. No symptoms. Has gained about 4 pounds in weight.

*Autopsy*, Nov 13, 1907—Dog entirely well. Killed with ether. Pleural cavity opened in 6th space. Finger introduced for palpation of pleural surface of original thoracotomy wound. There were no adhesions, and the line of pleurotomy could not be distinguished owing to its serous covering. Lungs and heart removed in toto. Right chest wall removed. There were no adhesions between visceral and parietal pleuræ at any point. Both pleural cavities fluid free, and normal in appearance. Heart not displaced. Lungs and heart removed in toto and inflated with apparatus, a cut being allowed in conduit regulated to keep lung at a given stage of inflation. The lung tissue appeared to be normal throughout. Numerous easily separated adhesions between lower lobe stump and adjacent surfaces of middle lobe and mediastinal or "butterfly" lobe. The middle lobe as a result of these adhesions had assumed a cabbage-like appearance. (See Photograph E).

CASE XXVII—Operation *Pleurotomy*. Clamping and release of right lower lobe. Result *Recovery*. Object Apparent good progress of Case XXV encouraged me to attempt second lower lobe excision with new apparatus.

Sept 16, 1907 Boston terrier—bull terrier mongrel, weight 26 pounds. All sterile arrangements completed when ether cone slipped from its attachment. Asepsis broken in reapplication, also possibility of infection of sterile rubber protection tubing on two of valve cocks.



C s XXVI -E

gltl w 1 b (A) St mp (B) R ght mid lobe





CASE XXVI b —Excision right lower lobe, (A) Stump (C) Mediastinal lobe turned up  
wards (B) Right middle lobe

Laparotomy sheet slid downwards during these manœuvres and incision was consequently made by mistake in seventh intercostal space. Soon evident that withdrawal of lower lobe would be difficult through this space. Under full traction only about three fourths of lobe could be withdrawn necessitating a large stump which would be difficult to close tight. Rather than run the risk of a mortality under these conditions the stomach clamp which had been applied as after five minutes application removed. Considerable manipulation of the lung had thus occurred. At one moment on manipulation pulse beats suddenly became very slow and respiration nearly ceased. When lobe was released both functions were restored to normal without change in pressure. This was doubtless due to irritation of vagus terminals. (See changes at this stage of operation in tracing.) In spite of considerable trauma to lower lobe after which hemorrhagic areas were apparent as well as small atelectatic areas I concluded to attempt recovery in this case, thus to test the resistance of normal lung tissue to such manipulation. Thorax wall sutured in layers as in Case XXV. Time one hour.

Sept. 17 1907 Dog as lively as before operation. Showed no signs or symptoms of any sort. Temperature 102 pulse 140 respirations 24.

Sept. 18 Temperature 100 pulse 90 respirations 20.

Sept. 20 Dressing removed. Wound clean and dry. Chart and notes omitted.

Nov. 15 There has been no interruption to normal convalescence.

*Autopsy*—Dog killed with ether. The thorax well showed strong cicatrization of all layers which were adherent to one another. There was no fluid in either pleural cavity. There was one small light adhesion on between the inferior surface of the right lower lobe and the diaphragm. The contour of the right lower lobe was normal throughout. There were no hemorrhagic, emphysematous or atelectatic areas at any point and the parenchyma presented a normal homogenous pink coloration. In other words there was no evidence that the lower lobe had ever been under clamp compression.

CASE XXVIII—Operation. *Total excision of right lower lobe.*  
Result Recovery Object To further test the effect of pneumectomy of a lower lobe.

Sept. 20 1907 Fox terrier (brindle spot) eight 18 pounds.  
Technique of this operation was identical with that of Case XXV. Visceral pleura incised annularly / incl from clamp and attempt made to roll it back to form a pleural cuff. This was partially successful although pleura being incorporated in lung parenchyma required some dissection for its separation. Torsos of inverting Lembert sutures were thus easily and successfully taken.

This operation was most satisfactory in that each step of the technique was successfully carried out and the mechanism of the new apparatus was excellent.

Sept. 21 Dog hungry and not inclined to eat. Prognosis poor.

Sept 22 Temperature 103.6, pulse 170, respirations 60 Dog seemed "sick unto death" Pleuritic effusion feared Chest aspirated in axillary line, 7th space No fluid obtained

Sept 23 No improvement, except in respirations (48) Refused food Characteristic hitch at end of short expiration present in previous fatal cases

Sept 24 Able to hop down from bench No food taken Drainage had been so unsuccessful in above fatalities that I preferred to wait The following day dog began gradually to take a turn for the better Food taken with considerable hand-to-mouth coaxing Dog walking about and looking better

Sept 27 Temperature 103.6, pulse 160, respirations 30 Wound clean and dry

Sept 30 Temperature 102.4, pulse 110, respirations 22 Dog much improved Peculiar action of hind legs noted Dog cannot jump without falling Apparent weakness beyond lumbar spine Hind legs cross in walking, and a tottering gait is noted

Oct 25 Dog has gained weight and eats well Spastic action of hips and legs persists

Nov 10 There is a slight kyphosis in lumbar region, and a deep skin ulceration in same region one-half inch from vertebral column

*Autopsy*, Nov 13, 1907—General condition excellent Dog etherized Anterior neck dissected and trachea freed Trachea clamped at end of inspiration and cut Object of this was to determine the exact size and condition of the cavity left by lower lobe excision previous to post-mortem collapse of lungs

Portion of lower right chest wall removed Remaining lobes of right lung found in close apposition to parietes, indicating normal inflation Vacated space was not filled by compensatory dilation of remaining lobes, nor by heart displacement, nor by an accumulation of fluid Unlike Case XXV, however, the space was about half filled with peculiar looking material resembling lymph in texture, but of a reddish color It seemed to arise from all pleural surfaces which bounded the space previously occupied by the lower lobe With a finger it could be wiped away from these surfaces without difficulty

Lungs and heart excised in toto Stump of lower lobe firmly adherent to diaphragm, middle lobe, mediastinal lobe and pericardium These adhesions were freed with some difficulty

Tissue examined by Wolbach proves to be free granulations

CASE XXIX—Operation *Imitation of an exploratory operation for tuberculosis, with removal of two isolated foci* Result *Recovery* Object While watching prognosis of Cases XXVI and XXVIII to do a less radical operation

Sept 22, 1907 Large black bull mongrel, weight 26 pounds Incision triangular in shape, with apex towards median line Apparatus satisfactory throughout operation Found it advantageous to increase pressure more by added influx of compressed air and less by sinking glass tube in water column In other words, increased compression with



C XXVIII - E f ight l w l be (A) S mp (B) k ght m ddac  
l be (C) Left l we l be (H) Heart.



CASE 111 —Excision of right upper and middle lobes (A) Stump of middle lobe (B) Stump of upper lobe (C) Mediastine on butterfly lobe

diminished resistance resulting in the same manometer readings as in the reversed conditions

Right upper lobe withdrawn and handled roughly Doyen clamp applied two inches distal to root extra thoracic. An oval shaped fragment the size of an almond was then excised from internal surface of lobe. Three ties taken in wound thus made. Bared surfaces approximated with linen and an inverting of pleural surfaces accomplished. Middle lobe then withdrawn and clamped. A triangular shaped piece with sides  $1\frac{1}{2}$  inches long then amputated from the tongue of this lobe. Usual treatment of stump. Lower lobe not disturbed.

Sept. 3 Dog very lively as before operation. Solid food at once.

Oct. 14 There has been no change in this dog's condition. He has gained weight and is active as usual.

Dec. 8 Dog has been a good laboratory animal and has been kept for physiological tracings during autopsy.

CASE XXX—Operation *Amputation of upper and middle lobes (right)*. Result *Recovery*. Object To repeat an amputation of upper and middle lobe as in Case XX where as will be seen in photograph scarcely more than half of these lobes had been amputated. With new intercostal technique and use of spreader more complete pneumectomy could undoubtedly be performed.

Sept. 27 1907 Black pointed nose mongrel. Usual technique of last few cases with new apparatus employed. The advantages of the new apparatus are most gratifying. The control is simple the conduits are wide the connections are solid and I am entirely satisfied of its practicability.

Sept. 28 Very slight languor. Solid food taken day after operation.

Sept. 30 Normal chart. Temperature 102 pulse 7 respirations 20.

Nov. 20 This dog's convalescence has been absolutely uninterrupted.

*Autopsy*—Dog killed with ether. No fluid in either cavity. Microscopically parenchyma of both lungs normal. Stumps of middle and upper lobes adherent to one another with adhesion also to upper surface of lower lobe. These adhesions were freed and the lungs and heart excised and photographed.

Pieces of lung stumps placed in Zencke's fluid for later section by Wolbach to determine nature of repair.

#### SUMMARY OF THE ABOVE THIRTY CASES

CASE I	Pleurotomy. Death 4th day
CASE II	Application of positive pressure. Recovery
CASE III	Pleurotomy one rib excised. Recovery localised empyema.
CASE IV	Pleurotomy one rib excised. Recovery
CASE V	Excision portion middle lobe. Death 6th day
CASE VI	Pleurotomy one rib excised. Recovery

CASE VII	Pleurotomy one rib excised	Recovery
CASE VIII	Pleurotomy two ribs excised	Recovery empyema
CASE IX	Excision tip of middle lobe	Recovery
CASE X	Excision one-third of upper lobe	Recovery
CASE XI	Excision one-half upper lobe	Recovery
CASE XII	Excision two-thirds middle lobe	Recovery
CASE XIII	Excision three right lobes	Death, 5th day
CASE XIV	Pleurotomy three-rib-flap	Death, 3rd day
CASE XV	Excision three-fourths middle lobe	Recovery
CASE XVI	Excision three-fourths middle lobe	Recovery
CASE XVII	Dorsal pleurotomy	Recovery
CASE XVIII	Dorsal excision left lower lobe	Death, 9th day
CASE XIX	Excision middle lobe	Recovery
CASE XX	Excision one-half upper and middle lobes	Recovery
CASE XXI	Excision right lower lobe	Death, 3rd day
CASE XXII	Excision three right lobes	Death, 5th day
CASE XXIII	Intercostal pleurotomy without rib excision	Recovery
CASE XXIV	Excision three right lobes	Death, 3rd day
CASE XXV	Excision right lower lobe	Death, 2nd day
CASE XXVI	Excision right lower lobe	Recovery
CASE XXVII	Clamp and release of lower lobe	Recovery
CASE XXVIII	Excision right lower lobe	Recovery
CASE XXIX	Excision portions of upper and middle lobes	Recovery
CASE XXX	Total excision upper and middle lobes	Recovery
Total 9 deaths, 21 recoveries		

*Conclusions*—I think I am not mistaken in stating that the foregoing shows a lower death rate in experimental operations on the lungs and pleura than has hitherto been reported

From this practical test of the suitability of the positive pressure method of inflation for intra-thoracic surgical procedures, I am convinced that, at least for experimental laboratory work, a positive pressure apparatus such as I recommended in photograph D entirely obviates the necessity of the negative pressure cabinet. I refer not to physiological experimentation alone, but to laboratory operations on the thorax in which recovery is desired. In the above enumerated cases, I do not ascribe a single death to the use of positive inflation as such. Neither do I recognize symptoms after operation which can be justly attributed to the use of positive pressure.

It remains for me to further justify the reliability of this method by making blood pressure tracings of the pul-

monary and aortic systems to test whether under proper control of the apparatus disturbances in these factors are any greater than those resulting from the negative pressure method. By further investigation I hope also to determine the absolute cause of pleuritic effusion and death following total one sided pneumectomy and to test different methods of thoracoplasty including artificially produced mediastinal and diaphragmatic herniæ with the object of at least partially obliterating the unoccupied cavity. I recognize that successful total pneumectomies of normal animal lungs without thoracoplasty have been claimed but such cases are extremely rare and I question whether such procedure will ever become a reliable one.

As a matter of fact total extirpation of a lung would rarely be occasioned in the human except in cases of new growth wherein the chest wall would ordinarily be involved and a thoracoplasty would be the operation of choice.

It is conceivable then that a large majority of death in the above series were caused by operative procedures which are never indicated and under such normal conditions as are never present. Should we exclude these fatalities then granting that the apparatus was not responsible there is reason for encouragement from these experiments that for partial lobe excision for exploratory operations and for removal of foreign bodies we have a reliable method which is not attended by the inconveniences and expense of a negative pressure cabinet. Nor has it been proved though stated that interlobular abscesses and other localized inflammatory conditions of the pleural cavity may not be approached through regions uninvolved brought to the wound walled off and drained as in intra abdominal operations.

In closing I will call attention again to the eight objections raised by Sauerbruch in his publication of 1904 and attempt to answer them.

I The change in method of breathing

Sauerbruch refers here to the method of rhythmically inflating the lungs regardless of the normal reflex mechanism



of respiration It is evident in the use of such an apparatus as this, and that described by Brauer, that the animal continues to breathe in normal fashion, but is assisted in so doing by air compression which prevents lung collapse

2 Interstitial emphysema of the lung as a result of artificial in-pumping of air

It may be stated that in the above thirty cases no evidence of emphysema have been recognized macroscopically It is probable that the microscopic sections will show localized emphysema in the region of the lung stumps A great effort has been made to prevent distention of the lung beyond its normal limits, and when such conditions are maintained there is no apparent reason for the development of emphysema

3 The effect on the circulation

I have made no observations on pulmonary blood pressure during the existence of positive pressure I believe, however, that if the resistance to the lung is not carried to excess that the normal relations between the general and pulmonary pressures will be little disturbed I add one of a series of tracings which I have made to show the comparatively slight respiratory and circulatory disturbances which occur in the course of such operations as the above under positive pressure

4 The persistence of pneumothorax at the abandonment of artificial inflation

By the maintenance of the positive pressure until the thoracotomy wound is closed, exaggerated a trifle as the last pleural stitch is tied, it has, as the results indicate, been possible to avoid the persistence of a pneumothorax

5 The great loss of heat

This factor must be admitted, as seen by the above records The temperature of a cabinet is high by necessity, although that of an operating room also might be so rendered Nor do I credit any of the above fatalities to this loss of heat

6 The great danger of infection to the pleura as a result of the extensive air exchange in the pleural cavity





This danger is doubtless present. If infectious organisms are in the vicinity however it would seem difficult to exclude them from a pneumatic chamber.

#### 7 The necessity of tracheotomy

This is obviated by the use of an air tight mask as shown in photograph. In this a great advantage can be claimed over many of the well known respiratory devices in which tracheotomy is necessary.

#### 8 The difficulty of narcosis

This difficulty has not been experienced in the application of this apparatus. The animals have been evenly anesthetized and none have been lost from over etherization.

I gratefully acknowledge the assistance and encouragement given to me in this investigation by Prof. Walter B. Cannon of the Physiological Department. Through his courtesy and help I have become familiar with the use of physiological apparatus and technique which have enabled me to make certain observations along the lines of pathological physiology which will be reported in a second paper.

For reports and consultation in connection with the pathological aspects my thanks are due to S. B. Wolbach of the Pathological Department.

The apparatus and new instruments were executed by H. M. Webber, mechanic at the Harvard Medical School.

# SHOULD CHOLECYSTITIS AND CHOLELITHIASIS BE ANY LONGER CONSIDERED MEDICAL AFFECTIONS, AND WHAT ARE THE USUAL CONSEQUENCES OF SO TREATING THEM?

BY CHARLES B G DE NANCREDE, M D,

OF ANN ARBOR, MICH,

Professor of Surgery in the University of Michigan and in Dartmouth Medical College

My attention was recently called to the views apparently held concerning cholecystitis and gall-stones by the rank and file of the profession, by a remark of my chief of clinic, 'that the general profession at present seems to occupy the same position towards biliary surgery that it did ten years ago towards appendicitis' I am satisfied that this is largely true, and that the real importance of certain biliary conditions and the impossibility of successfully dealing with them otherwise than by the knife, is not widely enough recognized. The idea is certainly too prevalent in the profession that to warrant a diagnosis of cholecystitis some jaundice should be present, and that a painful, tender tumor in the region of the gall-bladder should be demonstrable with possibly chill, but certainly marked fever, while the failure to detect jaundice seems to many, unavowedly, to unsettle their tentative diagnosis as to the possibility of cholecystitis. If asked, point blank, whether uncomplicated inflammation of the gall-bladder could produce jaundice, the majority would answer correctly, no, but practically the absence of this symptom staggers them.

My first postulate is that cholecystitis is an infective process which precedes the formation of calculi, and that either with or without stone formation this disease of the gall-bladder implies certain potential dangers. It is true that the most common form of cholecystitis is produced by germs

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\* Read before the Rochester Academy of Medicine, May 3, 1907

of low virulence but what warrant exists for the belief that secondary infection with virulent organisms will not take place causing infectious cholangitis—often a most fatal condition—or suppuration or gangrene of the gall bladder with fatal peritonitis? What certainty is there that crippling adhesions involving the stomach and intestines will not form with persistent ill health or even hopeless gastric dilatation? The absence of gall stones at an operation in chronic cholecystitis does not prove that none have been passed or preclude the probability of their new formation. Let me illustrate my contentions by reading the notes of a few cases

1 Mrs F age 76 years A few days previous to entrance to the University of Michigan Hospital had chills followed by high fever and severe pain in the right hypochondriac region. She claimed never to have had any biliary trouble and believed this to be her first attack. Operation revealed a ruptured gall bladder with old inflammatory trouble. Five days later a single non faceted stone was removed from the cavity formed among the adherent bowels.

2 Mr G age 72 years Had never recognized pain or fever and had never vomited. very slight jaundice was present. Operation revealed suppurative cholecystitis with stones blocking the cystic duct.

3 Mrs C age 48 years Vomiting pain radiating to right shoulder chills fever and clay colored stools were noted. Operation showed old adhesions around gall bladder and common duct. no stones. cure followed loosening of adhesions and drainage.

4 Mrs D age 41 years Severe jaundice no vomiting chills or fever pain described as intestinal cramping marked diarrhoea. At operation gall bladder much distended no stones. Cholecystitis with cholangitis causing jaundice.

5 Mr A age 47 year rapidly developed after an attack of ptomaine poisoning gastric and hepatic pain irregular attacks of chills fever and sweating acholic stools intense jaundice and rapid loss of flesh and strength. An obscure thickening in the region of the pancreas was detected. The family physician's

diagnosis was not concurred in of common duct stone, but infective cholangitis was believed to be present. His condition forbade operation.

*Post-mortem*—General suppuration cholangitis was found with obstruction of the common duct from some undetermined condition of the pancreas. Early hepatic drainage would have saved this patient.

6 Mr M, age 56 years, had gradually developed severe jaundice, commencing about seven weeks before admission to the hospital. Neither pain, vomiting, chills, clay-colored stools nor stones in the stools were noted. Operation showed gall-bladder containing a pint of bile, cystic duct kinked by weight, no stones, ante- or post-mortem, the patient dying from hemorrhage in thirty-six hours, having hematemesis, bloody stools and free bleeding from the gall-bladder. This case must have had long standing cholecystitis, judging from the conditions found.

Disease of the gall-bladder was present in all the cases quoted. No extended argument is needed beyond the histories of these patients to demonstrate that cholecystitis with or without stone may present few of the ordinary symptoms expected, that it may prove a menace to life when least suspected, and that the symptoms in some instances closely simulate those of common duct stone, while suppurative and gangrenous cholangitis is seen to be a most dangerous condition which may develop at any time from a chronic cholangitis.

Although the natural resistance of the hepatic and somatic tissues may prevent the most dangerous complications related, or even gain the victory so far as life is concerned, if the assistance of art is invoked, it must be admitted that these conditions of the gall-tracts can only be efficiently dealt with by proper operative intervention, and that early hepatic drainage will often prevent a lifetime of invalidism, or avert death. Moreover, the deteriorating effects of chronic jaundice, cholemia, and infection account for those unrestrainable capillary hemorrhages that not uncommonly destroy life after otherwise successful operations. Listen to these notes

7 Mrs P age 50 years Had been deeply jaundiced for many months past The stools had been clay colored since the commencement of the jaundice except when tar colored from altered blood Patient had frequent epistaxis and there were areas of subcutaneous hemorrhage At operation one stone was removed from the common duct and one from the gall bladder Death resulted from steady capillary hemorrhage in thirty six hours

8 Mrs C age 28 years Had had attacks of pain for the past seven weeks located in the liver region but radiating to the epigastrium Slight jaundice with repeated chills and fever were noted Numerous old adhesions were found at operation the pancreas was two or three times its normal volume A single loose stone was found in the gall bladder On the third day the drainage from the gall bladder was largely blood and quantities of it soaked the dressings The hemoglobin and number of red cells rapidly diminished every evidence of severe loss of blood with profound shock being present After the seventh day the hemorrhage ceased and the patient recovered here the presence of old adhesions proved that chronic cholecystitis had been overlooked and that the nearly fatal hemorrhage resulting from the acute jaundice due to cholangitis could have been averted by timely hepatic drainage

9 Mrs B age 55 years Severe jaundice of long standing was present No chills fever or pain At operation malignant disease encircling the common duct with liver secondaries was found Severe hemorrhage took place from the wound on the second day but this finally ceased and the patient recovered

Case 6 as you recall also died after profuse bleeding Are not these cases adequate proof of the dangers of hemorrhage after chronic cholemia and jaundice?

The tendency to serious capillary hemorrhage usually occurs only in cases of pronounced and prolonged jaundice and cholemia but an undetected mild grade of cholemia preceding a comparatively short and slight jaundice may provide the necessary conditions as exemplified by Case 8

The constant presence of bile salts in the blood vessels leads to such destruction of the red cells that an improv



erished, imperfectly elaborated pabulum is supplied to the minute vessels, while at the same time these salts attack and compromise the integrity of their intimal coat, of which, indeed the capillaries are alone formed

An answer to the question "what causes jaundice in hepatic ailments" will clarify our ideas. Obstruction of the common duct will compel back pressure and resorption. Adhesions, pressure from without by a tumor, or inflammation of the pancreas, distortion or narrowing of the duct orifice by traction on the duodenum (as is sometimes caused by a loose kidney) can produce choledoch obstructive jaundice as well as a calculus. Infective cholangitis causes obstruction of the intra-hepatic ducts from swelling of their lining membrane, interfering with or arresting the exit of bile, thus favoring its resorption. When the jaundice is not due to common duct obstruction it can only be produced in this way, if we except a hematogenous origin. Thus the presence or absence of jaundice in cholecystitis, cystic duct kinks or obstruction of this by adhesions, gall-stones or cystic duct stones is explicable, as well as the absence or presence of acholic stools, because the jaundice is due to a complicating cholangitis, and not directly to any of the conditions mentioned. Again, the illusory improvement occasionally seen in carcinoma of the liver, from lessening or disappearance of the jaundice, simply means a lessening or complete subsidence of the swelling of the intra-hepatic duct linings, not to a change in the carcinomatous disease.

A rather blind acceptance of the group of symptoms supposed to indicate the presence and passage of gall-stones is too prevalent in the profession, viz, pain starting in the right hypochondrium radiating to the back and preferably to the right shoulder, violent vomiting, a sudden cessation of the pain, jaundice, clay-colored stools, and calculi to be found in the stools, if careful enough search is made. Again, many practitioners having seen chills, fever and sweating with marked jaundice and acholic stools in some cases of common duct obstruction expect to find it in all such cases,

and are also surprised when no common duct obstruction is found after such symptoms. Still further jaundice means with many as a complement acholic stools and when the latter are absent doubt arises as to any gall tract disease being present.

A moment's reflection upon certain anatomical facts should modify any such views. Why should there be jaundice even if the cystic duct is blocked by a stone if the common duct is patent? There is no reason unless cholangitis be present which in a certain number of cases of cholecystitis and cholelithiasis does obtain because organisms of more than usual virulence are being excreted with the bile and set up inflammation in the intra hepatic ducts.

Why should gall bladder disease be accompanied by chills followed by fever and sweats unless suppurative or gangrenous cholecystitis is present? Certainly no reason exists. Excluding these two conditions why should agonizing attacks and acholic stools be viewed as produced only by an occluding choledoch stone instead of being mere evidences of common duct obstruction by adhesions tumor pressure kinking from over distension of the gall bladder or enlargement or disease of the pancreas. Fever chills and sweats occur because the lymphatic and vascular arrangement of the common duct favors a rapid absorption of infective products while if the cystic duct be blocked absorption is slow and difficult on account of the scanty lymphatic network of the gall bladder.

As instances of the uncertainty of the significance of jaundice other than as a symptom of cholangitis and because these cases present other features of interest let me run over abstracts of the histories of a score or more of cases asking you to bear in mind the points emphasized in the cases previously mentioned.

10 Female age 47 years—Had typhoid fever when a child. Vomits during attacks pain in right hypochondrium which extends up to the right shoulder slight jaundice present.

no chills or fever, stools normal, no stones detected in stools, calculi found in gall-bladder

11 Woman, age 47 years Had typhoid fever as a child, vomiting during attacks following sharp pain in epigastrium, no jaundice, stools normal, no stones were found, calculus in cystic duct

12 Man, age 46 years Had typhoid fever ten years previous to commencement of present trouble which is of a number of years duration Vomiting lasts from one to twelve hours in each attack, pain referred to epigastrium, continuous jaundice for the past three months, stools negative, calculi in gall-bladder

13 Man age 57 years Had typhoid fever five years before onset of present trouble Localized pain, jaundice, acholic stools Common duct obstructed by enlarged pancreas

14 Man, age 45 years Had typhoid fever some years ago during which he had jaundice, vomiting during attacks with pain radiating upwards from the right hypochondrium, has had frequent attacks of jaundice and his stools are frequently acholic, occasional blood in stools and vomitus, calculus in common duct

15 Man, age 62 years Severe vomiting during attacks, pain over liver extending to epigastrium, marked jaundice, stools negative, according to patient, occasional chills, fever and sweat, calculi in both gall-bladder and common duct

16 Man, age 45 years Had history of typhoid fever preceding the gall-stone trouble During the course of the enteric fever he was jaundiced and has been much of the time since then The stools are clay-colored, blood is sometimes seen in the stools, and in the vomitus, vomiting with the exacerbations of pain over the liver radiating upwards, stone in common duct

17 Woman, age 55 years Has had no vomiting, jaundice or acholic stools, neither chills nor fever, stools negative At operation gall-bladder contained many small stones

18 Woman, age 39 years Vomiting absent, markedly jaundiced, pain over liver radiating upwards, 184 gall-stones in gall-bladder

19 Woman, age 33 years Occasional jaundice, stools negative, pain over liver radiating upwards into right chest, solitary stone in gall-bladder

20 Woman age 51 years Vomiting was present with chills and fever stools negative calculi in gall bladder

21 Mrs C age 47 years Occasional vomiting with slight jaundice noted stools negative pain over liver region radiating into epigastrium and up beneath the sternum neither fever nor chills stone in common duct

22 Woman age 50 years Vomiting jaundice acholic stools containing gall stones hepatic pain neither chills nor fever numerous calculi in gall bladder a sinus persisted and a subsequent exploration revealed carcinoma of the gall bladder but no calculi

23 Woman age 66 years Occasional vomiting with slight jaundice during attacks chills and fever acholic stools stone removed from common duct

24 Woman age 34 years Severe jaundice chills with fever and acholic stools were noted pain was located in lower part of the abdomen gall bladder filled with stones persistent fistula Returned two years later Stone found in common duct This patient died one year later probably from malignant disease

25 Man age 56 years Early and severe jaundice developed with repeated attacks of chills fever and vomiting acholic stools and calculi in the dejecta the pain commencing in the appendix region thence passing up to the liver Very numerous adhesions with small stone in the gall bladder

26 Woman age 30 years Vomiting jaundice chills and fever acholic stools with pain in right side extending up into right shoulder many calculi in gall bladder pelvic abscess formed and was operated parotid abscess also developed recovery

27 Man age 48 years Vomiting jaundice pain over liver normal stools gall bladder much dilated and diseased no stones anywhere mass in the head of the pancreas

28 Woman age 30 years Patient operated on elsewhere two years previously for gall stones but eight months later recovered twenty calculi from the stools She had had neither jaundice acholic stools nor aguish attacks She had daily attacks of colicky pain in the right side but at operation nothing but extensive adhesions were found especially between the small intestines and gall bladder

29 Woman, age 62 years No jaundice or acholic stools; pain felt in right side, stone in gall-bladder

30 Woman, age 47 years Has had neither vomiting nor jaundice, pain radiated from liver to the left side, calculi in gall-bladder

31 Woman, age 53 years Jaundice, vomiting, acholic stools, chills and fever all present, with pain in right side Stones only in gall-bladder, not in common duct

32 Woman, age 55 years Directly following convalescence from typhoid fever somewhat over two years before admission to the hospital, the patient had repeated attacks of severe pain radiating to the centre of the epigastrium with jaundice, neither vomiting nor acholic stools were present, stones in gall-bladder

33 Woman, age 48 years Typhoid fever one year before the onset of the gall-bladder trouble, vomiting, marked jaundice, chills and fever, stools negative, gall-bladder filled with stones

34 Man Vomiting, slight jaundice, epigastric pain, chills and fever, stones only in gall-bladder and cystic duct

35 Man Slight jaundice, vomiting only in first attack, pain over liver extending to the left thigh and also upward, stones in gall-bladder

36 Woman Slight jaundice, severe vomiting, pain in right side shooting upwards, calculi in gall-bladder and cystic duct

37 Woman, age 48 years Doubtful history of jaundice, movable kidney, operation for fixation of same revealed through the peritoneum a goodly sized fluctuating swelling at and in front of the lower pole of the kidney, closely simulating a distended renal pelvis Opening the peritoneum, a much dilated gall-bladder was found closely connected with the kidney and filled with stones

38 Man, age 43 years Slight vomiting and jaundice with normal colored stools containing numerous calculi Attacks of severe pain were experienced radiating upwards A rapidly increasing infiltrating tumor was found on the right side involving the abdominal parietes At operation an ovoidal segment of the abdominal wall was excised to gain safe access to the cavity Enormous mass of adhesions involving all the neighboring parts One large imbedded calculus was removed with innumerable

minute ones scattered among the adhesions. By microscope no malignancy.

39 Man. Obstructive jaundice due to stones which had ulcerated into the stomach and had been vomited before operation while others were found in the viscus post mortem. Enormous dilatation of the stomach existed for which a gastro-enterostomy was done.

40 Woman age about 50 years. Came to me with a correct diagnosis of enlarged stomach due to gastric ulcer or possibly malignant disease owing to the detection of a resisting mass in the right hypochondrium. There was an obscure history of what might have been gall bladder trouble. Operation showed a pylorus and duodenum almost occluded by the adhesions and an enlarged gall bladder crammed with stones. Owing to the feebleness of the patient and the primary demand for relief of the pyloric stenosis only a gastroenterostomy was done.

41 Man age 65 years. Showed symptoms of intestinal obstruction for only forty eight hours before operation. Operation by a colleague showed that the obstruction was due to a biliary calculus two inches in diameter. He was never supposed to have had biliary disease but had had stomach trouble for some undetermined period before this fatal illness.

42 Woman age 47 years. She absolutely denied after repeated questioning that she had had any form of illness before the attack initiating her present illness. She was a cultured woman and denied jaundice abnormal stools pain or discomfort until about one year previous to the time when she came under my care when an abscess rapidly formed one inch to the left of the umbilicus which had been opened by her attendant evacuating plain pus. The resultant sinus suggested a small fecal fistula due to ulceration of the bowel in a possible umbilical hernia but nothing except pus was ever detected. Operation showed a sinus tract extending upwards for about three inches directed towards the gall bladder in which were found a number of biliary calculi. No evidences of bile were found during the operation or the course of her rapid convalescence.

43 Man age 45 years. Had passed gall stones on several occasions after attacks of biliary colic but still had repeated attacks of pain vomiting etc. Operation showed that his last attacks could not have been due to the passage of gall stones.

because the cystic duct was obliterated. Among the dense mass of adhesions a medium sized calculus was found firmly grasped by a shrunken gall-bladder which contained no bile. The gall-stones, which had been previously evacuated in the stools, had evidently ulcerated into the colon, as shown by the conditions found at the operation.

44 Woman, age 47 years. Twenty-nine years ago had severe pain in the right side, in hepatic region, lasting two hours, which radiated to the region of the stomach and into the back. Patient had had similar attacks ever since at intervals of six months, sometimes these attacks will recur daily. Was entirely free for a period of five years. Has never been jaundiced. Stools normal. Never vomited. At operation the fundus was found to be thickened and was removed with a large portion of the gall-bladder, after extracting numerous stones. Pathological report carcinoma.

In the notes of the cases mentioned, one must be struck by the absence of many symptoms usually deemed to be almost universally present in the classes of cases described. Roughly analyzing the symptoms presented by these, with those noted in other cases taken at random from old hospital and private records I have found the following statements warranted. As was to be expected from the probability of infection attacking the smaller bile ducts, because of the passage through them of infected bile at some time during the numerous recurrences of the trouble, jaundice was present in seventy-five per cent of the cases, but in about one-third of these no calculi existed anywhere in the biliary apparatus. In about one-third the jaundice was practically continuous, but of this one-third more than half were not cases of biliary lithiasis. The evidence of the actual presence of jaundice in a certain number of cases was doubtful, resting solely on the alleged yellow staining of the conjunctiva, which was in some cases declared to be still present by the medical attendant when it was patently absent to my own eyes, and no biliary constituents could be detected in the urine. In this connection too much emphasis cannot be laid

upon the fact that a gall bladder crammed with stones provided catarrhal or infective cholangitis does not occur need never throughout the lifetime of a patient give rise to the slightest jaundice hence the absence of this symptom does not exclude the presence of gall stones etc

In about one sixth of the cases vomiting occurred during the majority of the attacks while in one-third of the cases studied emesis was only occasional in some being only present during the first attack.

The number of cases whose notes were sufficiently full to draw any definite conclusions from are too small to lay any great stress upon the percentages given but they do serve to show the actual happenings in the practice of one surgeon during a given period

Acholic stools were determined in a little more than one fourth of the cases and only in one-eighth of these acholic cases were calculi ever detected in the stools

Chills fever and sweats occurred in almost one third of the cases while in the remaining two-thirds these symptoms were positively excluded or had not been recognized by the patient as pronounced enough to be recalled

Less than half of those suffering from these agonizing paroxysms (so commonly thought to be due to common duct stone) had calculi so located or even duct obstruction from other causes No attempt is here made to discredit the value of these symptoms as usually indicative of choledoch obstruction most often from stone but numerous cases in my practice illustrate the undoubted fact that these symptoms are merely evidences of an infectious process so located that its products can be readily absorbed so that severe cholecystitis or gangrene of the gall bladder with cholangitis may provide the necessary amount of toxic substances and also the jaundice and acholic stools

The location of the pain experienced during an attack of gall stone colic is an interesting study While this point has not been rigorously determined in all the cases upon which this paper is founded you will recall that in the notes



of a number of those read the pain has been located as follows, over the liver, over the liver and epigastric region, over the liver and abdomen, the appendix region, the right hypochondrium, on the opposite side of the abdomen, on the right side, on the right side not passing beyond the median line, extending from the hepatic region down into the right thigh as well as somewhat upwards, in the epigastrium alone, over the right side and extending upwards, while in only a few cases did the patient describe the pain as commencing in the hepatic region and extending up to the right shoulder, or back of the neck, hence, the absence of the "characteristic pain" believed in by the laity and by many of the profession is of little moment

Again, an interesting query arises in connection with the uncertain location and character of the pain What then is hepatic colic? Is it always due to the passage of a calculus? This question is sometimes difficult to determine In a considerable proportion of these cases, frequent, even daily attacks of pain, perhaps attended with colic were experienced, where no stones were present, or where stones were absolutely fixed by the contracted gall-bladder walls and dense adhesions Sometimes these attacks were what might be called atypical, but I am convinced from my whole experience that during an attack of biliary colic, it is vastly more likely that a stone does not pass than that one does Distension of the gall-bladder or common duct from temporary obstruction due to kinking, or ball-valve action of a calculus, slight adhesions or strictures of the ducts, the passage of a small aggregation of cholesterol crystals or biliary sand, all these inducing spasms of the muscular coats of the bladder or ducts, slight attacks of localized peritonitis, gastric tenesmus induced by adhesions, intestinal colic from the same causes, distension of the stomach because of spasmodic pyloric obstruction alone, or this with actual dilatation of the stomach, exacerbations of the ulcerating process in the colon, duodenum, or stomach, whereby large stones are often evacuated from the gall-

bladder all are conditions that are frequently called attacks of gall bladder colic in addition to the actual expulsion from the gall bladder hepatic or common ducts of a calculus. One of two recent cases of supposed gall bladder disease experienced frequent attacks of what were considered to be typical biliary colic due to the passage of stones the attacks sometimes recurring daily from considerable periods the pain being located in the right hypochondrium and the vomiting being both violent and prolonged. Abdominal section revealed a partial intestinal obstruction produced by a dense band of omentum passing from the hepatic flexure of the colon to the abdominal wall in its passage downwards being firmly adherent to and constricting the ascending colon. Enormous dilatation of the caecum coli and appendix had resulted. The second case on admission had fever leucocytosis and a painful tumor somewhat above McBurney's point but there was tympany between its upper border and the liver yet upon the strength of an alleged slight jaundice with severe vomiting early in the attack commencing as soon as the pain became pronounced the condition was viewed by some of my assistants as one of cholecystitis with calculi. I operated for appendicitis and found nothing but this.

A point of great etiological interest is the fact that seven at least of these patients perhaps more had had very recently or antedating their biliary trouble by a greater interval typhoid fever. All know that the gall bladder is not infrequently inflamed in this disease and also that typhoid bacilli have been cultivated from the gall bladder of patients who have had enteric fever many years before—in one instance seventeen years in another twenty years had elapsed. Moreover non-viable typhoid bacilli are not uncommonly found in the substance of gall stones.

I shall now ask certain questions warranted by the facts given in the cases cited and confirmed by many others not mentioned. Why should pain be always felt which radiates to the epigastrium to the right shoulder or indeed in any special direction when operation reveals in many instances

that owing to adhesions and perhaps serious ulceration from the pressure of gall-stones, the sources of pain are really not in the biliary apparatus at all, but in the subhepatic and pyloric regions?

Vomiting is in proportion to the pain, the amount of irritation of the splanchnic system, and the consequent vasomotor paresis resembling shock, and to individual idiosyncrasy, why then need this be in any way indicative of anything except the severity of the pain?

If the pain must stop suddenly, and this is a proof of the passage of a calculus, why are certain facts easily demonstrable, viz, that in the majority of attacks of so-called biliary colic, the pain subsides rather slowly, no stones are found in the stools, even temporary obstruction of the common duct cannot be demonstrated, and at operation it is often patent that none of the stones, or the stone present, could have even commenced to enter the cystic or common duct?

It must then be clear that to demand the so-called "characteristic pain," the vomiting, the jaundice, the clay-colored stools, the sudden cessation of the pain and the recovery of the stones from the stools, is unreasonable, and resembles the demand for high fever, sweats, generalized abdominal distension, obstinate constipation, marked vomiting, pain and tumor in a definite locality, and inability to extend the right thigh, which a decade ago many practitioners seemed to think must all be readily detectable, before a diagnosis of appendicitis should be made

**Dangerous Sequelae** I have, when reading the notes of cases, or formulating the statements founded on them, called attention to the dangers of cholecystitis and cholangitis, but for the purposes of emphasis I desire to restate them, premising however, that the probabilities of each complication can neither be stated in figures, nor foreseen in any given case

Chronic inflammation of the gall-bladder precedes and predisposes to the formation or reformation of gall-stones, with all their dangers Adhesions to the duodenum, stomach

and colon are common. Compression and obstruction of the common duct may by adhesions lead to chronic cholemia and infective cholangitis. Gastric adhesions originated by cholecystitis and its sequelæ more often produce so-called stomach disease and serious dilatation of this organ than is commonly believed. Should virulent infective organisms reach the chronically diseased gall bladder acute suppuration with rupture or even gangrene may result with all its possible sequences. Carcinoma of the gall bladder is not an uncommon sequence of cholelithiasis. See cases 22 24 44. These direful results have nearly all been exemplified in the histories of my cases.

Once gall stones are formed all the dangers attending cholangitis are present with the greater risks of suppuration rupture gangrene stomache and intestinal crippling and ulceration involving the stomach or colon with all its dangers dilatation of the stomach carcinoma intestinal obstruction from a large stone perhaps increased in bulk by calcareous intestinal accretions and fatal hemorrhage even without operation.<sup>1</sup> A greater refinement in analysis might perchance reveal some other obscure dangers but what has been already said really embraces all of importance.

*Diagnosis*—When temporary obstruction of the common duct has occurred on more than one occasion with jaundice pain—characteristic (?) or not—the stools being acholic aguish paroxysms having been noted with sudden cessation of pain rapid clearing up of symptoms and the recovery of calculi from the stools he who runs may read but with the irregular symptoms which many cases present the matter is not so easy. A diagnosis can best be made by exclusion. Stomach and duodenal ulcer gastric carcinoma neoplastic obstruction of the bowels acute or chronic pancreatic disease intestinal obstruction by bands dilated stomach renal calculi or disease a dislocated kidney which is sometimes accompanied with jaundice appendicitis, the gastric crises

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<sup>1</sup>More than one such case has occurred recently at the University Hospital.

of locomotor ataxia, and spinal caries must all be considered, while examination of the urine often gives valuable information by revealing the unsuspected presence of biliary substances when jaundice has passed away or is too slight for a certain opinion. The association of appendicitis and cholecystitis must not be overlooked. Without going into the differential diagnosis of the affections mentioned, you will readily understand that during these investigations, it is hardly possible not to recognize such conditions as will lead you to investigate the biliary apparatus so rigidly as to arrive at correct conclusions in the absence of all supposedly pathognomonic symptoms. Again, despite all care, doubt may still exist between gastric and duodenal ulcer, disease of the pancreas, and appendicitis, or even a neoplasm. In such cases, because an operation can alone afford relief for any of these conditions, and when one incision will enable the surgeon to deal with any or all of these ailments, if present, an exploration should be made.

In conclusion let me again urge, that this paper simply represents the average conditions presented by cases, gathered at random, not that another series in my own practice would necessarily present exactly similar complications or symptoms.

My object will have been secured, if I shall have induced some of my readers to recognize the existence of many serious hepatic and biliary conditions, which can only be properly met by use of the knife. If these conditions must be recognized early to secure the best results, a diagnosis must be often reached by discarding the group of symptoms usually relied upon, and reaching correct conclusions by a careful analysis of the symptoms, viewed in the light of anatomy, physiology and modern pathology. In certain rare cases, as already said, only an exploration will decide the question.

# THE VALUE OF THE DIFFERENTIAL LEUCOCYTE COUNT IN ACUTE APPENDICITIS

BY ALFRED H. NOEHREN, M.D.

OF NEW YORK.

Internist, German Hospital.

THE question of the value of blood examination in acute abdominal conditions is still the subject of much difference of opinion. The principal reason for this is that the statistics so far collected and published on this subject are few and therefore no definite conclusions have been reached. If it can be demonstrated that blood examination is an aid in deciding doubtful cases and in determining indication for immediate operative intervention, its value to the surgeon becomes very great.

To furnish additional data on this question is the purpose of this paper. It is based on 72 cases of Appendicitis and its sequelae in which a blood examination was made just previous to operation, so that the result of the examination can be compared with the actual condition present. The cases are from the services of Drs. Kammerer, Kiliani, and Willy Meyer at the German Hospital, New York.

The findings at operation have been divided into 5 classes:

1. Diffuse Peritonitis (D.P.)—Free pus in the greater part of the peritoneal cavity.
2. Spreading Peritonitis (S.P.)—Free pus in a limited portion of the abdomen but not walled off by adhesions.
3. Gangrenous Appendicitis (G.A.)—Appendix gangrenous to greater or less extent, not walled off by adhesions.
4. Inflamed Appendix (I.A.)—Appendix inflamed, no gangrene, no perforation, no adhesions around it. Empyema of appendix without gangrene is included in this class.

5 Abscess (A)—Pus outside of appendix, but walled off by adhesions from the remainder of the peritoneal cavity

When blood examination in acute surgical conditions first came into practice, the amount of leucocytosis only was considered. An increased number of leucocytes meant the presence of inflammation or of pus, an increasing leucocytosis meant extension of the process, an absence of leucocytosis above 10,000 signified a mild process.

In 69 cases of this series, the leucocyte count and the conditions found at operation were as follows

	D P	S P	G A	I A	A	Total
Under 10,000	—	—	2	2	3	7
10,000-15,000	5	1	2	8	8	24
15,000-20,000	3	1	3	7	7	21
20,000-25,000	2	1	1	1	4	9
Over 25,000	2	1	3	—	2	8
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A study of this table shows that a leucocytosis above 10,000 may mean anything from a general peritonitis to a simple inflamed appendix or encapsulated abscess. A leucocyte count alone, therefore, is of no aid in diagnosing the severity of the condition or the necessity of immediate operation.

Dr Frederick E. Sondern, who has done much work along this line, attaches great value to the differential leucocyte count as an aid in diagnosing the severity as well as the presence of intra-abdominal conditions. He says <sup>1</sup> "The increase in the relative number of polynuclear cells is an indication of the severity of the toxic absorption, and the degree of leucocytosis is an evidence of the body resistance toward the infection. Purulent exudates were rarely, if ever, present with low polynuclear percentages irrespective of the height of the leucocyte count, while very

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<sup>1</sup> "The Value of the Differential Leucocyte Count in Diagnosis,"  
Am Journal of Medical Sciences, Dec., 1906

high polynuclear percentages almost invariably indicated their presence even if the total leucocyte count was low

The body resistance which Dr Sondern says is measured by the degree of leucocytosis we can disregard for our purpose. It is of little importance in the question of deciding for operation in surgical conditions because if these conditions are present operation must usually be done.

On the other hand the severity of infection is a very important point in deciding whether operation is necessary at once or can safely be postponed. If the percentage of polynuclears is an index of the severity of the process it ought to be a very important aid to the surgeon.

In 60 cases in which a differential count was made the results and findings were as follows

	D P	S P	G A.	I A	A	Total
Over 90 per cent.	3	1	3	1	—	8
85-90	6	—	2	5	6	19
80-85	2	1	3	7	4	12
75-80			2	5	6	13
Under 75				4	4	8
						<hr/> 60

We see from the above that in every case with 90 or more per cent of polynuclears immediate operation was surely indicated except in one and even in that case there was an acute inflammation of the appendix. Every case under 80 per cent could probably wait being either an encapsulated abscess or a simple inflamed appendix except in two cases of gangrenous appendix both of which had 78 per cent.

These figures would make us conclude that every case of appendicitis with 90 per cent or more of polynuclears needs immediate operation whereas every case under 78 per cent can safely wait for further developments.

Let us take the cases between these two extremes and tabulate them in detail.



	DP	SP	GA.	IA	A
78 per cent	—	—	2	—	—
79 “	—	—	—	1	4
80 “	—	—	1	3	2
81 “	—	—	—	—	1
82 “	—	1	1	—	—
83 “	2	—	1	—	—
84 “	—	—	—	—	1
85 “	—	1	1	1	3
86 “	3	—	—	—	1
87 “	1	—	—	1	2
89 “	1	—	1	2	1

The cases of peritonitis are grouped among the higher percentages, but the other conditions are about equally distributed

Our conclusions then would be a percentage of 90 or more of polynuclears indicates a very severe process that needs immediate intervention, a percentage below 78 indicates a mild or “safe” process in which immediate operation is not necessarily indicated, between these two, the higher the percentage the more likely is the process to be a severe one, without, however, excluding the possibility of a mild or safe process

Another phase of this subject is presented by Dr Chas L Gibson<sup>2</sup> He emphasizes “the relative disproportion of the polynuclear percentage to the total leucocytosis” as being more reliable than the leucocyte count alone or the polynuclear percentage alone He says “It (this relative disproportion) is of value chiefly in indicating fairly consistently the existence of suppuration or gangrene The greater the disproportion, the surer are the findings, and in extreme disproportions the method is practically infallible”

He suggests the use of a standard chart in which a base-line represents 10,000 leucocytes at its left extremity and 75 per cent polynuclears at its right extremity Every centimetre above the base-line represents 1000 additional leu-

<sup>2</sup> “The Value of the Differential Leucocyte Count in Acute Surgical Conditions,” *ANNALS OF SURGERY*, April, 1906

cocytes and 1 per cent increase in the polynuclears. For instance for a case with 16 000 leucocytes and 88 per cent polynuclears a dot is made at the left 6 cm above the base line and at the right 13 cm above the base-line. The two are then connected by a straight line which in this case would be a rising one from left to right.

In 20 cases of acute appendicitis he found a rising line in 2 cases it was horizontal in 3 cases it had a downward tendency. He says: All the severe lesions those with gangrene of the appendix or progressive peritonitis showed a rising line while all the cases indicated by a falling line were distinctly mild types such as well defined safe abscesses.

Let us see how our cases bear out this statement. In 52 cases in which both a leucocyte count and an estimation of the polynuclear percentage was made the results were as follows:

	D P	S P	G A	I A	A	Total
Rising line	7	1	4	7	4	3
Horizontal line	2	—	1	1	2	6
Falling line	2		4	5	10	23
						<hr/> 52

Although the majority of our cases bear out Dr Gibson's statement there are so many exceptions that it hardly seems of much value to the surgeon. Thus of 14 cases of diffuse or spreading peritonitis 6 showed either a horizontal or a falling line and judged by the standard chart would be mild cases.

In addition to the above cases one other deserves mention. The patient had symptoms suggestive of a spreading peritonitis following appendicitis. Blood examination 20 200 leucocytes 86 per cent polynuclears almost a horizontal line by the standard chart. At operation a ruptured ectopic pregnancy was found with blood clots in the peritoneal cavity. Immediate operation was clearly indicated.

A study of the above tables shows that of the three methods of blood examination described, estimation of the number of leucocytes alone, the percentage of polynuclears alone, and the relative disproportion between the two, the second is the most reliable. Not only is it the most reliable, but it is of positive value in diagnosing the severity of abdominal conditions and deciding the question of immediate operation.

Furthermore, as the estimation of the polynuclear percentage is a very simple procedure, requiring only glass slides, a stain, and a microscope, and can be more quickly and easily done than the counting of the leucocytes, it should not be neglected in any acute case of appendicitis. If it results in one of the absolute percentages, 90 per cent or above, 78 per cent or below, it alone can be relied upon in determining immediate operative interference. If it lies between these two, it will add just so much to the physical signs and history, according as it approaches the one or the other extreme.

I will cite just one case out of many where it practically determined the diagnosis of the severity of the condition.

Man admitted to hospital with history of one previous attack. Two days before admission had sharp pain in upper part of abdomen with vomiting. Next day pain localized in lower right quadrant. Physical examination showed marked tenderness and rigidity of lower half of right rectus muscle, but with an indefinite feeling of a mass. Slight tenderness and rigidity of lower half of left rectus muscle. Leucocytes, 14,800, per cent of polynuclears, 87.

Here was a case in which it was difficult to make a diagnosis between spreading peritonitis and beginning abscess formation. But 87 per cent of polynuclears in this case, according to our findings above, would speak for the severer process. Operation was done immediately and a gangrenous appendix with free fluid in the peritoneal cavity was found.

## CONCLUSIONS

1 Blood examination in cases of acute appendicitis is of great value in determining the severity of the condition and therefore deciding whether or not immediate operative interference is indicated

2 The degree of leucocytosis formerly considered an important diagnostic aid is too variable to be of any practical value.

3 The relative disproportion between the percentage of polynuclears and the degree of leucocytosis is reliable in a majority of cases but the number of exceptions is so great that its practical value in determining immediate operation becomes very small

4 The estimation of the percentage of polynuclears alone is more reliable than either of the preceding methods and therefore together with the fact that it is the one most easily made the method to be recommended

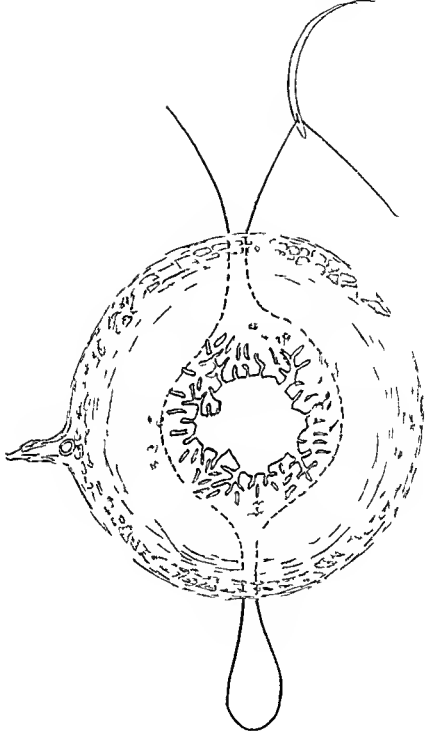
5 A polynuclear percentage of 90 per cent or more indicates a severe process that needs immediate operative interference a percentage below 78 per cent means a safe or mild process a percentage between the two extremes speaks for the one condition or the other according as it approaches the one extreme or the other

## A NEW TECHNIQUE FOR DEALING WITH THE APPENDIX STUMP

BY CHANNING W. BARRETT, M.D.,  
OF CHICAGO

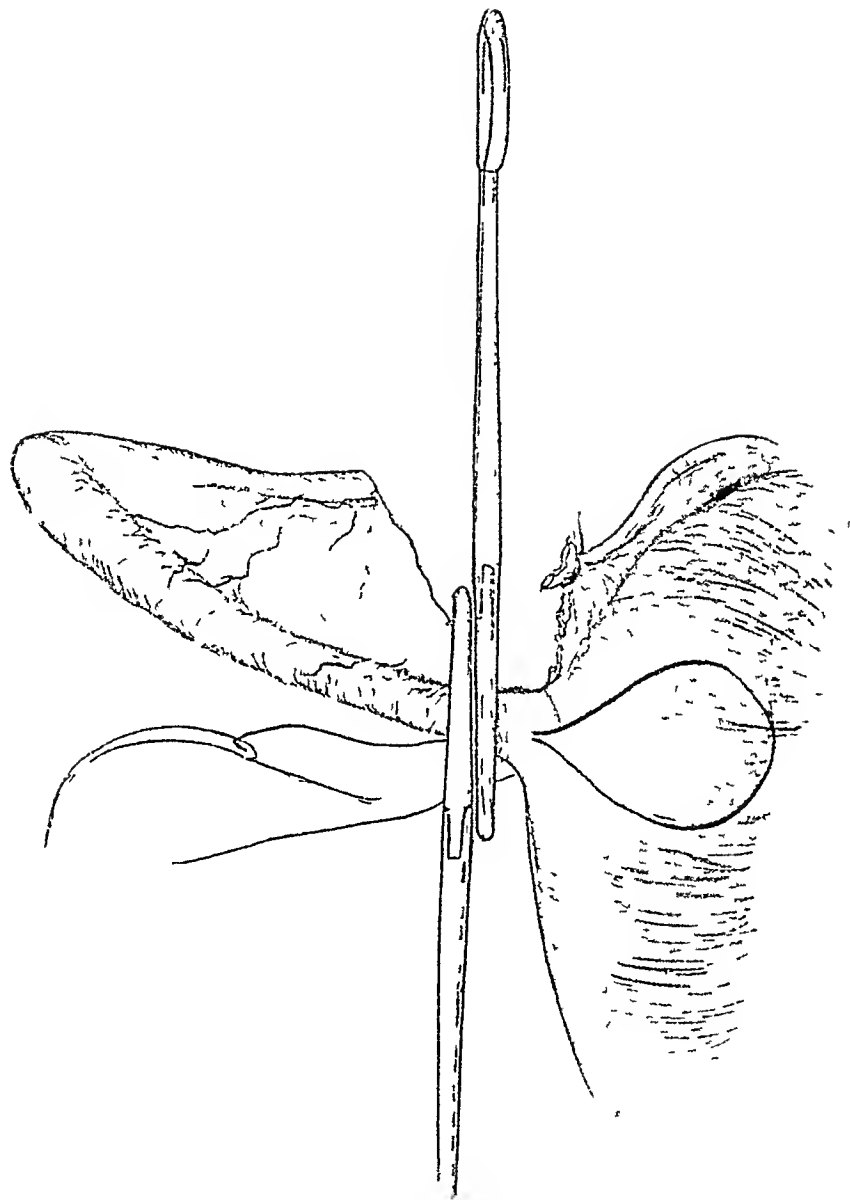
As the larger questions of appendicitis have been settled we are now as perhaps never before turning our attention to the technique. Numerous papers have been devoted to the management of the stump. Many cases are operated upon to relieve minor but persistent or oft recurring symptoms. The disability is not great, but this may lead to a severe attack. To encourage the acceptance of surgical relief before the severe attack occurs, the operation should have the following advantages—1 It must be safe. 2 It must reach the appendix through as small an opening as is consistent with good work, in order that the abdominal wall shall not be unnecessarily weakened. 3 No considerable stump of appendix should be left outside or inside the bowel. 4 The stump should be dealt with in such a way as to have no opportunity for leakage of feces or septic material from the bowel, and should allow no possibility of hemorrhage into the bowel, or peritoneal cavity or cellular tissue. 5 No unnecessary opportunities for adhesions should be created. 6 The above advantages in dealing with the stump should be attained without tedious sewing, undue manipulations, or unnecessary opening of the bowels.

The method of tying the stump and leaving it uncovered, formerly practiced and again being revived, is easy of application and allows of no immediate escape of bowel contents, but often leaves an undue portion of the appendix, necessitates a non-absorbable ligature, leaves opportunities for adhesions, and, above all, connects the bowel cavity with the peritoneal cavity by means of a tied fistula lined by mucous membrane, which is difficult to obliterate. This may not have the same



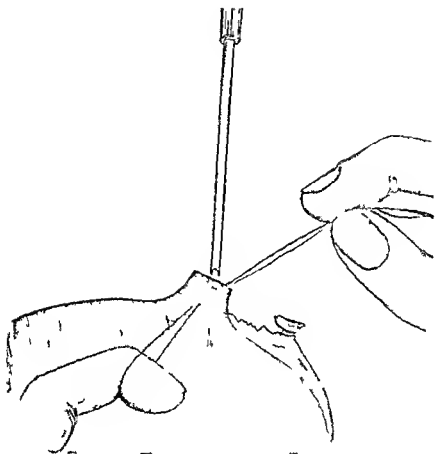
h gth m hod f pl th

FIG. 2



Meso-appendix tied, cut and pushed down, leaving the appendix free. The suture is placed at the base of the appendix as shown in Fig. 1

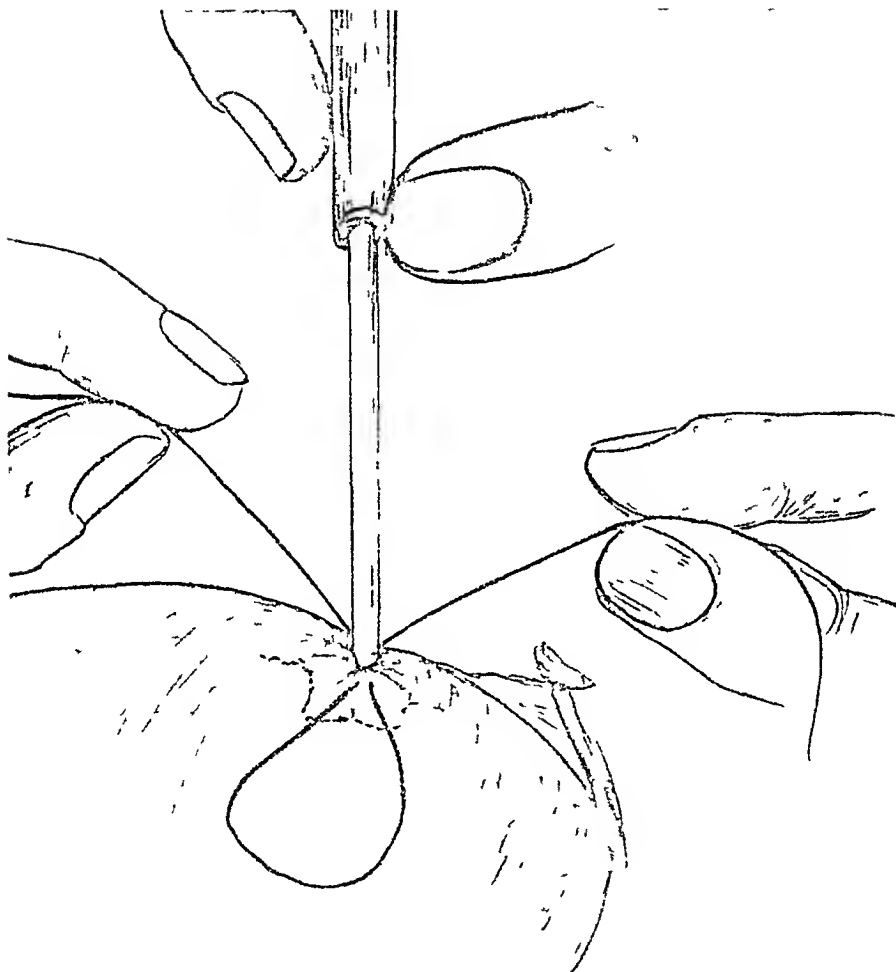
F 3



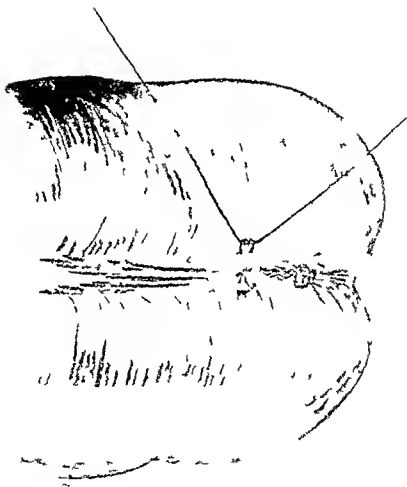
App d t f b g l d l d y t b d h h l



FIG. 4

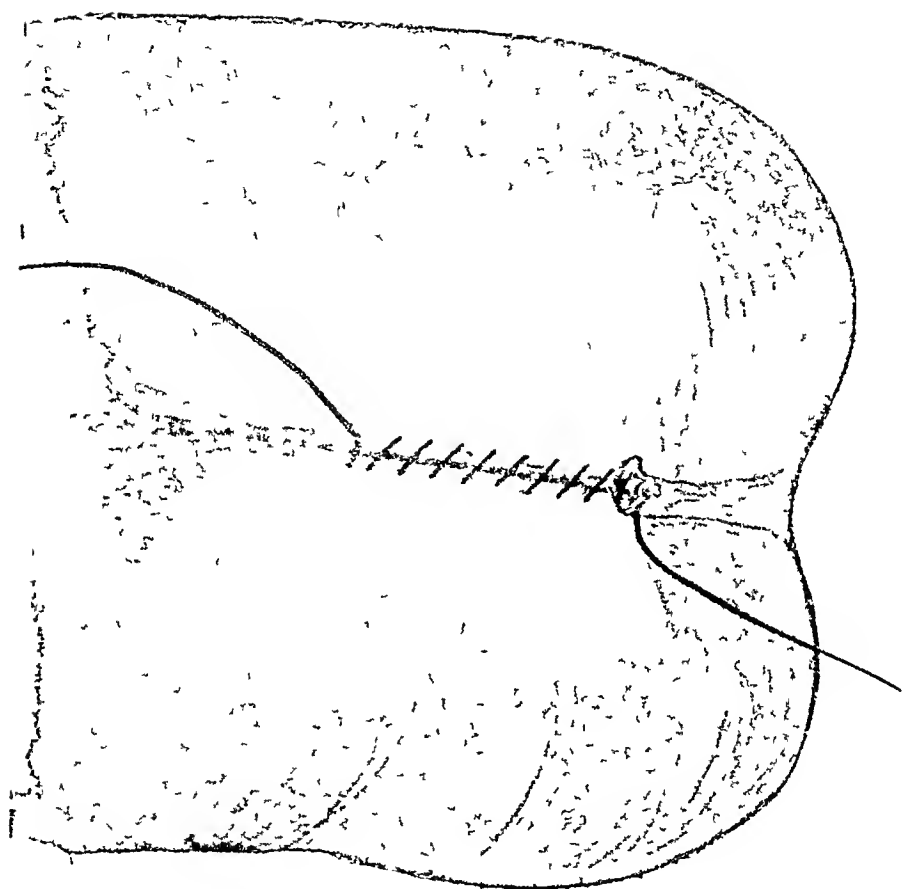


Appendix inverted showing stump with a dotted line



L gat b g draw d Th d m h p bl b f h k ed

FIG 6



Appendix region overstitched with running Lembert suture, which is then tied to one on mesoappendix

17



Bo 11 1 1 11 1



objection in cases in which draining is necessary but in clean cases where ideal surgery may be done this is unsurgical

The method of dissecting the appendix out of the cæcum and closing with interrupted suture has the advantage of getting rid of all the appendix but the great disadvantage of an open bowel while manipulations are going on with the possibility of leakage of feces. It introduces into the clean appendicitis case the dangers incident to intestinal surgery with their added mortality. The cuff method has the disadvantage of mucous membrane to mucous membrane is tedious and has nothing to commend it if the tying off of the whole stump is safe and furnishes a pocket for infection if the stump is infectious. The same may be said of sinking the tied stump by means of a purse string. The purse string method may be made to prevent leakage of feces is quickly done and leaves little opportunity for adhesions but is now being condemned because it does not sufficiently provide against hæmorrhage. The technique of Harris making the ligature include the artery obviates this to some extent but it is not entirely reliable. The method proposed of tying the appendix in the cæcum is impractical and dangerous. A method which I now present depends for its success upon the following facts that portion of the stump which lies outside the ligature before the stump is inverted is the only portion tied the rest lies in direct communication with the bowel untied. Unlike the ordinary purse string suture then the suture is so placed that all the vascular portion of the appendix lies outside the suture as shown in the cut. The technique is as follows —With as small an incision as possible the appendix is secured and freed from adhesions the mesoappendix is clamped tied and cut so that the appendix stands up directly from the bowel. A number two catgut of good tensile strength is used on a straight or curved needle. The needle enters the tissue at the junction of the bowel and appendix one fourth the circumference from the mesoappendix. It is made to enter the deep structures and yet avoid the lumen and come out on the opposite side of the appendix. It is then made to enter very close to its exit sweep

around the opposite side of the lumen in the deep structure and emerge close to its former entrance. A loop of the catgut is retained opposite the two ends. We now have nearly all the appendix lying outside the suture. The appendix is clamped a little distance above the suture. Another clamp is placed immediately above this and the appendix cut between the forceps. The ligature is now made to hold the cæcum by traction upon its two ends and the opposite loop. The forceps are now removed and a forked appendix tucker is made to carry the crushed stump into the bowel. At the same time the ligature is drawn down and encircles the tucker but may be drawn as tight as desired, as the tucker cannot hold on to the stump. All forceps used to invert the stump have a tendency to hold to it and return it. The one-point tucker is worse than useless in dealing with the untied stump, leaving the forceps to be preferred.

The operation is completed by overstitching the stump with a continuous Lembert suture, carrying it along the free edge of the mesentery running to the mesoappendix stump and this suture is tied to one end of the ligature on the mesoappendix.

This operation then ties all the vascular portion of the appendix, turns the raw edges in, brings peritoneum to peritoneum, does not pucker the bowel, and these advantages are gained through the use of a suture which is easily placed, making the operation safe and easy of performance.

# OBSTRUCTION OF THE INTERNAL URINARY MEATUS BY FOLDS OF MUCOSA \*

BY WILLIAM JONES M D

OF PORTLAND OREGON

WHEN an elderly or old man presents himself for relief of difficult urination the inference is immediately drawn that enlargement of the prostate is the cause of the trouble. If on examination the prostate is found to be enlarged and residual urine is present in considerable quantity the proof again that the prostate is considered conclusive and removal of the gland the only radical and sufficient remedy. This in brief outlines the attitude of the profession at this time.

Some personal experiences in this class of cases and some matters of common observation have led me to gradually modify this view.

It is a matter of common knowledge that much enlargement of the prostate frequently exists without producing obstruction to any appreciable extent. I have and I believe most surgeons have met with cases of considerable enlargement where ability to empty the bladder easily was present in these cases the enlargement is usually uniform and symmetrical.

Where the prostatic enlargement is irregular and unsymmetrical obstructive symptoms are much more likely to be present. When the enlargements are sub-vesical and sub-urethral they can be completely and radically removed by the perineal route and this I believe to be the best direction of approach for their removal. When they project well into the interior of the bladder forming as it were intra vesical growths their complete removal by the perineal route is very problematical and uncertain. The first case that caused me to realize this fact in a practical way was the following —



The patient, 65 years old, was referred to me for removal of the prostate, with the following history. He had been annoyed by the necessity of passing urine with more frequency than normal, and being obliged to get up two or three times at night to empty the bladder for a period commencing one year previously. About one month previous to consulting me these symptoms had rapidly increased and the force of the stream had diminished, until for the last two weeks he had been obliged to depend entirely upon the catheter. On examination the prostate was found to be greatly enlarged in a uniform and symmetrical way. The soft catheter passed very easily, and there was no cystitis. Operation was advised and accepted, the gland was removed by the perineal route with the full expectation and belief that it would remove the cause of the obstruction, a drainage tube was left in for four days, then removed, the urine dribbled from the wound for a few hours, then stopped altogether, neither could he voluntarily pass any urine, it was necessary to resort to the use of the catheter. After a few days without being able to pass any urine, it became apparent that the real cause of the obstruction had not been removed. This was stated to the patient with the recommendation that a supra-pubic operation be done. This proposal was accepted and accordingly carried out. It revealed a very thin collar of tissue arising about the internal urinary meatus, in the shape of a horse-shoe, with the opening of the shoe toward the pubes.

This tissue was not perfectly flabby but had a little rigidity, sufficient to cause it to stand erect about the outlet of the bladder. It yielded, however, to the slightest pressure, and collapsed into the opening, completely closing it like a valve. When the bladder was empty there was no pressure to force it into the opening, but when the bladder was more or less filled the pressure of urine within it would be sufficient to make the valve effective. This collar was excised down to the muscular layer all around the opening. When the supra-pubic wound closed, he was able to pass urine and empty his bladder. Macroscopically the specimen was made up of a very thin layer of mucous membrane folded over a thin layer of fibrous tissue. This dense tissue seemed to be an upgrowth from the prostate and was the efficient cause of the obstruction. Its removal primarily would probably have been sufficient without the removal of the gland.

There is another form of obstruction of the internal urinary meatus having its origin in the prostate that I have encountered—that is a small pedunculated growth rising into the bladder and projecting itself into the opening I have met with one case of this sort

The patient was 65 years old He had been troubled with some frequency of urinating but had thought but little of it Suddenly he observed the urine to be bloody This alarmed him and he sought medical advice On examination it was found that his bladder was greatly over distended even after he had passed as much urine as possible The soft catheter was somewhat obstructed as it passed into the bladder No enlargement of the gland could be made out It was decided to catheterize him regularly in the hopes that the bladder would gradually return to its normal condition However on passing the catheter the next time greater resistance was encountered The succeeding time it was impossible to pass the soft catheter and the silver catheter was used It was impossible to pass any catheter after this Under the pressure of necessity the patient consented to a surgical operation A supra pubic opening was made in the bladder which revealed a pedunculated tumor the size of a very large pea springing from the bladder wall just at the posterior margin of the internal urinary meatus it dropped into and closed the opening like a ball valve It was removed partly by cutting with the scissors and partly by twisting It seemed to be of prostatic origin (which was proven later by microscopic section) It had evidently grown from the surface of the gland forcing itself gradually upwards until it had become intravesical There was no enlargement of the prostate whatever that could be detected by bimanual examination from within the bladder and within the rectum

When the supra pubic wound healed he was able to pass urine though not to empty the bladder Daily catheterization was continued for a considerable time and the residual urine gradually diminished At the last examination it was moderate in amount It has been my experience that when the bladder has been greatly overdistended for a long time from a mechanical obstruction that the power to completely empty the bladder is

not wholly regained even after the obstruction has been completely removed

There is another form of obstruction of the internal meatus, that is not of prostatic origin, with two cases of which I have met The relation of these cases will best describe the lesion

The first case was a pilot, 69 years of age, who was referred to me for removal of the prostate He had not passed urine in a natural way for twenty years, during the whole of that time he had depended upon the catheter, which passed without any obstruction For the last two or three years he had suffered from the effects of catheterization, such as repeated attacks of oichitis and a mild cystitis This had brought him to seek surgical relief Upon examination only the slightest enlargement of the prostate could be made out However, being still unduly under the influence of the prostatic tradition, I concluded that the gland must be the cause of the obstruction, and prepared to perform the operation of its removal, for which he had come It was carried out by way of the perineum On removing the drainage tube, he could not pass any urine, and the catheter had to be used as before After waiting a few days, there being no change for the better, the obstruction remaining absolute, a supra-pubic opening was recommended and accepted This disclosed the obstruction to be a fringe of mucous membrane that grew all about the meatus, which dropped into and closed the urinary passage, but it offered no sign of resistance to the passage of the catheter This was excised all about down to the muscular layer When the supra-pubic wound closed he was able to pass his urine and empty his bladder There was no dense tissue in the specimen and no indication of a prostatic origin

The second patient was 65 years of age When he consulted me he had suffered incontinence of urine for a month and gave the usual history of gradual increasing frequency of urination, particularly at night This had extended over a period of about a year On examination I found a tumor rising nearly to the umbilicus He passed as much urine as he was able to, which was very small in amount Introducing the soft catheter, which easily passed, 50 ounces were withdrawn There was no en-

largement of the prostate whatever and it was perfectly uniform in shape. Regular catheterization was carried out twice a day for several days to see that the bladder was not allowed to become overdistended in the hopes that it would regain its power to empty itself. The amount withdrawn each time was practically the same. The activity of the kidneys was prodigious to fill and overflow this viscus twice a day.

A supra pubic opening in the bladder was made and showed the same sort of obstruction as in the preceding case that of the pilot. This was excised. When the supra pubic wound was closed he could pass his urine but there were 12 ounces residual. The catheter was used once a day for a month when the residual urine was reduced to two ounces. At this time he left for home with instructions to use the catheter once a day until the residual should be reduced to about one ounce and then to use the catheter at longer intervals.

In another case the obstruction was of a still different character. Patient aged 56 previous genito urinary history negative. For past year had had increasing difficulty in passing the urine. Latterly there had been increasing desire to urinate but ability to pass but a very small amount at a time. Examination showed the prostate not to be enlarged and the bladder to be overdistended. After observing him for a few days and there being no improvement a supra pubic opening was made in the bladder which revealed the presence of a band or fold immediately posterior to the internal meatus and encroaching upon it. This was deeply divided with the scissors. When the supra pubic wound had healed he was able to pass urine easily and empty the bladder completely and has continued to do so since.

In my opinion these obstructions are of rather common occurrence and the proper route by which to remove them is the suprapubic.

# POSTOPERATIVE X-RAY TREATMENT OF MALIGNANT DISEASE \*

BY RUSSELL H BOGGS, M D,  
OF PITTSBURG, PA

THE purpose of this paper is to show the necessity of referring malignant cases early for post X-ray treatment, and not waiting until recurrence has taken place, as has been the case in many instances in the past. We should never ask one horse to pull a twenty horse power load. Another oversight, which is common among surgeons, is that the patient is told that X-ray treatment should be given, without mentioning that there is any difference in the manner in which the treatment is administered.

It is the duty of all to urge the necessity of radiation being given in such a manner as to saturate the site of operation, and also the adjacent lymphatic glands, thus producing a physiological result. In prescribing mercury for syphilis, great fear of producing salivation would not induce us to prescribe 1/100 of a grain when two grains were indicated. The same is true in treating carcinoma with the X-ray.

This comparison appealed to me after having gone over the subject with a number of surgeons and Roentgenologists, and having been consulted by at least a dozen patients during the past year, where a recurrence has taken place. None of these cases showed any evidence of radiation although one patient had received fifty treatments.

Inadequate treatment is not only useless, but I believe, small doses stimulate growth of tissue, while efficient radiation retards and destroys new growths.

A study of the lymphatic glands and of their involvement by carcinoma where the adjacent organs are effected,

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\* Read before Pittsburg Academy of Medicine, Nov 26, 1907

as well as the physiological action of the X ray on lymphoid tissue must be understood before either the surgeon or Roentgenologist can speak intelligently of post X ray treatment. Otherwise his opinion may be based upon cases which were not carcinoma at all or upon the results obtained in cases which were hopeless when referred for treatment or cases improperly treated. One physician has referred to me at least fifteen cases of recurrent carcinoma in which the deep glands were involved none of which lived over three years and because none of these cases lived over three years he discredits the value of X ray in malignant disease although all the external signs of recurrence cleared up in at least five cases. Now had he referred these case within a few days after operation and had the glands adjacent to his lines of incision been rayed to such an extent that these glands had been obliterated that is to say had undergone a fibrous degeneration possibly the results would have been different in some cases at least. The great trouble has been that much of the post X ray treatment has been given in a half hearted manner without really knowing what physiological results should be obtained.

In the past the possession of an X ray machine was all that was thought necessary but in the future since the pathologist has come to our assistance and has told us why we are obtaining results and since we are able to give a therapeutic dose the value of the X ray has changed.

The treatment of malignant disease by the X ray varies with the situation and no rules can be laid down unless so modified as no one would state that the X ray is as useful in the treatment of carcinoma of the uterus as in epithelioma. It is a question whether we can expect to even prevent recurrence in carcinoma of the uterus on account of the adjacent glands being so deeply situated while in cancer of the skin it is a question if it is necessary to operate at all in many cases.

Probably post X ray treatment is the most useful in carcinoma of the breast because here the adjacent glands

under the clavicle and near the site of the operative field can be made to undergo fibrous degeneration by a number of post X-ray treatments, but if the bronchial and mediastinal glands are involved, I believe, the operation is not only useless but also the X-ray treatment as far as a permanent cure is concerned

A word in regard to cases where recurrence has taken place, following the Halsted operation. Out of a series of cases where recurrence has taken place, with nodules studded over the chest, I have been unable to apparently cure more than three cases, although some lived over three years. These cases all had bronchial and mediastinal involvement when radiation was begun. However, in about twenty-five per cent of these cases all external signs of the disease disappeared, and the patient improved in general health, more than likely this was due to the increase in metabolism which takes place under Roentgen treatment. To prove that bronchial metastasis had taken place when X-ray treatment was begun and that the radiation had nothing to do with internal glandular involvement, I made radiographs of a number of these cases and found the bronchial glands enlarged when they were referred.

When such a condition exists is it worth while raying these cases? This is answered by stating that the patient's life is prolonged from six months to three years and the health improved for a time at least.

Now what should we do when a patient with carcinoma of the breast presents herself for treatment? I am going to suggest the following from experience gained from studying a number of cases.

(1) If only a mass in the breast — The mass should be removed, a pathological examination made and if found to be cancerous, a complete operation done followed by X-ray treatment.

(2) If there is only a small amount of glandular involvement, complete operation followed immediately by intense X-ray treatment.

(3) If there is an extensive glandular involvement — intense radiation given daily until the axillary glands cannot be palpated Then complete operation and X ray if it is given at all given cautiously

The last statement was made from the study of ten such cases where glandular involvement was extensive and operation did not seem advisable when the diagnosis was made

To briefly summarize these ten inoperable cases (classed as inoperable as there was extensive involvement of both axillary and supra-clavicular lymphatics together with broken down masses or masses about to break down) seven were operated upon after thorough radiation In only two of these cases was there a radical or Halsted operation done and in the other five a modified operation was performed Of the two complete operations one is living four years and one died within twenty four hours Of the five modified operations two lived over three and one half years and one died within six months The other two are living and no sign of recurrence one at five and the other at seven months after operation Of the cases not operated one lived one year and the second is much improved after six months The third case has been in good health for four and one half years and the small hardened mass in the breast has remained stationary and freely movable and the glands in axilla which were as large as a walnut when treatment was begun cannot be palpated at all

I have repeatedly urged that both these cases be operated upon

Strange as it may appear the benefits derived from ante operative treatment in the above cases is marked compared with the results obtained in the treatment of recurrent cases after operation This leads me to believe that all cases of carcinoma of the breast should have thorough anteoperative X ray treatment or early and competent postoperative radiation

Three surgeons after operating on several cases in



which anteoperative Roentgen treatment had been given made the following statements

The enlarged lymphatics are if palpable degenerated into fibrous cords, the tumor mass is surrounded by scar tissue, its center having undergone caseous degeneration. A very noticeable and gratifying result of ante-operative X-ray treatment is the almost complete disappearance of the normal scar tissue which follows operation.

*Sarcoma*—The malignancy of sarcoma varies more than carcinoma and therefore the end results are not as good by any form of treatment. I have treated about twenty-five cases, all of these except eight were inoperable when they were referred, and out of the hopeless class I have only one case which has remained well without a recurrence over fifteen months, although some of them have lived for over two years.

This was in an inoperable sarcoma, at the junction of the sternum and clavicle, about twice the size of an orange, and very painful. Treatment was given in series for a period of six months when the mass was reduced to about the size of an egg. The patient refused operation and it was not urged as we considered that it would recur whether we operated upon it or not. Several similar cases remained stationary until they were removed when internal metastasis occurred promptly. It has remained stationary fifteen months, but it certainly is only a question of time until the result will prove fatal.

Of the others nearly all showed some improvement after the first fifteen or twenty treatments, that is to say the tumor decreased in size and the patient's general health would be much improved. In three lympho-sarcoma's the results were more marked, and one case, that had been refused operation in Baltimore, the mass in the neck almost disappeared for a period of six months when Coley's toxins were added to the X-ray. From this time the patient rapidly became worse and died from metastasis.

I have used Coley's toxins in a few cases but I cannot

say that the results have been any better and I am of the opinion that the Roentgen rays must be given more carefully if given in conjunction with the toxins

At the 1905 meeting of the American Roentgen Ray Society held in Baltimore Dr Coley read a paper and out of sixty eight inoperable cases treated by the combination of the X ray and toxine he only reported that in six cases complete disappearance of the disease was observed I believe that better results than this should be obtained by more powerful X ray treatment which could be given if no toxine were administered

In my opinion the time to use toxine treatment is at all is after the X ray has been used until the patient has received the increase in metabolism which is usually marked after from twenty or thirty exposures of X ray of sufficient intensity and auto-intoxication has subsided

My experience in post X ray treatment for sarcoma is limited to eight cases and this is certainly too small a number to more than state that it seems to be the proper method In one case of lympho sarcoma a recurrence took place while I was raying the patient As soon as this was noticed very intense radiation was given and in six weeks no glands were palpable The patient is still under observation and time alone can tell the end results In this connection I would like to report a case where the results seem brilliant from operation followed by intense radiation

Mis A operated upon by Dr O C Gaub July 4 1907 The disease started over the left temple and before the patient came to Dr Gaub the growth had been removed by another physician and recurred besides the cervical glands were involved on the left side

Dr Gaub removed the disease below the left eye and all the structures in front of the anterior scalenus muscle except the main blood vessel and nerve en masse down to the sterno clavicular articulation

The pathological examination revealed a melano-sarcoma X ray treatment was begun the second day after the operation

and given daily for a month, and then irregularly until fifty treatments were given. The present result is gratifying, but of course time is too short to say that there will be no recurrence. The cosmetic result is excellent, as there is less scar than one could possibly conceive since the wound healed by granulation. This is due undoubtedly to absorption of scar tissue by the rays. The absorption of the scar and adhesions is always very noticeable in post X-ray work.

# ENDO ANEURYSMORRHAPHY (MATAS) IN THE TREATMENT OF TRAUMATIC ANEURYSM OF THE FEMORAL ARTERY

BY J M ELDER M D

OF MONTREAL

SINCE the publication of Matas second article<sup>1</sup> on the subject of repairing wounds of blood vessels by suture a good deal of work experimental and clinical has been done to test his contention that ruptured arteries could be repaired in much the same way as injuries of other hollow viscera and under proper conditions with as good functional results

In the ANNALS OF SURGERY for September 1907 there appeared a most interesting symposium on The Surgery of the Vascular System by several prominent American surgeons and as the subject of this communication is very similar to some of the cases therein cited I have thought it would be well to publish it while the interest in the subject was still fresh in the minds of your readers

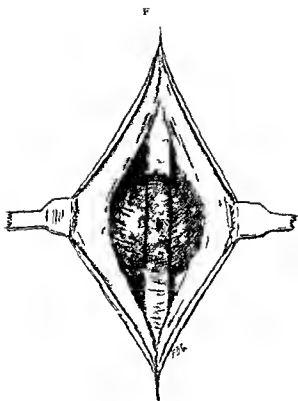
*History* (Montreal General Hospital No 12,8 Series 1907) -In July 1907 a healthy lad of ten years struck his right leg against the sharp nozzle of an oil can causing a small punctured wound just above and to the inner side of the popliteal space The nozzle was at once withdrawn and the wound bled freely but not furiously The family physician Dr D K Cowley of Granby Quebec saw the case and found that he could pass a probe into the wound upward backward and inward for a distance of two inches The end of the probe would then be close to the position of the femoral artery in Hunter's canal The wound was irrigated and a dry dressing applied and it healed apparently without incident the lad appearing to be quite well ten days after the accident

About one month later he began to complain of pain in the knee and soreness at the site of injury. His physician again examined the limb and found a tumor about the size of a Tangerine orange, situated under the scar of the former wound. The tumor was very tense and resistant (non-fluctuating) and no pulsation could be detected in it, but the stethoscope revealed a well-marked systolic bruit when placed lightly over it. The case was watched for eleven days, and it was noticed that the tumor increased rapidly in size and became softer and more fluctuating. The pain in the knee also grew steadily more severe and the lad could not extend the knee joint.

*On admission* to the hospital on September 11th the patient lay on the right side with right knee semi-flexed and supported on a pillow. The pulse was 84, temperature 100° F. A well-marked tumor was visible along the inner and posterior aspect of the right thigh at upper level of popliteal space. Examination confirmed the facts above noted by the family physician, and in addition there was noted much diminished pulsation in the right posterior tibial artery but no other signs of circulatory disturbance, there was local tenderness and heat over the tumor but no redness. Leucocyte count, 13,500.

*A diagnosis* of aneurysm was made and operation was carried out next day.

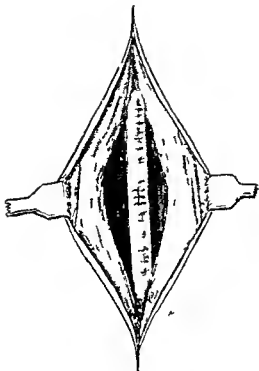
*Operation* —A vertical incision, three inches long, was made over the tumor, and we at once came down upon a fluctuating swelling about the size of a Florida orange. A director introduced through the capsule showed the contents of this cyst (for such it evidently was) to be dark blood. An Esmarch was applied to the thigh higher up and all bleeding controlled. The contents of the sac, consisting of thick, dark blood-clot, were then turned out, the quantity being about four ounces. The cyst wall, or sac, was evidently composed of connective tissue only, and upon swabbing the interior the artery was seen lying at the bottom of the sac, and in the vessel wall was an oval opening measuring  $\frac{1}{2} \times \frac{1}{4}$  cm (Fig I). Bright red blood spurted through this opening when the tension of the Esmarch was relieved. As soon as the parts were quite dry (as Matas insists upon) this opening was closed by three sutures of fine silk, a small, round, curved needle being used and care being taken to include the intima in the sutures (Fig II). The pressure of



Sh g l i m t o m l t h p g t h f m i n y



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A l y t d





the Esmarch was then taken off and the pulsations of the artery watched for a few minutes in order to make sure that the sutures were sufficient to control all hemorrhage. The lining of the sac was irrigated with sterile water and a cigarette drain with iodoform gauze inserted down to the artery after which the wound was closed.

The drain was removed in forty eight hours there being no oozing and there followed without incident primary union of the wound. The patient left the hospital nine days after operation though still forbidden to use the limb for two weeks. There was then equal pulsation in the two tibials with no pain or swelling anywhere. Dr Cowley has since written me that the boy is as well as ever and has absolutely no disability in the limb.

In this case one had evidently to deal with a sacciform aneurysm—really a false aneurysm inasmuch as the sac did not consist of dilated vessel wall but of the perivascular connective tissue. The continued stretching of this tissue would cause the pain complained of. It is likely that at the time of the accident the nozzle of the oil can had not actually pierced the wall of the artery but had struck it with sufficient force to cause subsequent necrosis and hence rupture of the vessel and formation of the sacciform aneurysm. As Mata and others point out this is the most favorable form of aneurysm to treat by this method of suture as one has only to close the opening to leave the vessel intact. In the fusiform (true) aneurysm the sac would also need to be sutured or obliterated in some way and could not be neglected as was practically done in this case.

The operation is certainly both in its rationale and its results much preferable to the risks of the ligature which could always be resorted to should the suture fail.

# FURTHER OBSERVATIONS ON THE TREATMENT OF PARALYTIC TALIPES CALCANEUS, BY ASTRAGALECTOMY AND BACKWARD DIS- PLACEMENT OF THE FOOT

BY ROYAL WHITMAN, M D,

OF NEW YORK,

Adjunct Professor of Orthopedic Surgery in the College of Physicians and  
Surgeons, Associate Surgeon to the Hospital for Ruptured  
and Crippled

TALIPES CALCANEUS is the most disabling of the forms of paralytic talipes because it is the result of the loss of the support and propelling force of the calf muscle. As the foot is drawn or forced constantly into dorsal flexion, the os calcis gradually assumes a more upright position, its posterior extremity becoming inferior. Thus the projection of the heel is lost and the depth of the arch is exaggerated, this characteristic cavus being more extreme in the cases in which the secondary plantar flexors retain their power which draws the fore foot backward without lifting the heel. In use the limb must be swung far forward in order to strike the heel fairly, thus straining and over-extending the weakened knee. The tissues of the heel bearing all the weight, become greatly hypertrophied, while the remainder of the foot having no essential function becomes simply an appendage to it. The disproportion between the posterior and anterior divisions of the foot, and in the size of the two feet, which is well marked even in the early cases as compared to other forms of paralytic deformity, is a striking illustration of the direct effect of impaired function on development. If one or more of the lateral muscles is paralyzed the foot is turned to one or the other side, and as the adductors are usually involved, the common deformity is valgus, so marked in extreme cases that weight is borne in part upon the inner malleolus.

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\* Read before the New York Surgical Society, November 13, 1907

In the cases of simple calcaneus the patient in locomotion might be likened to one walking on a Pirogoff stump with the added insecurity of two uncontrolled articulations and if lateral deformity is present the foot is rather an incumbrance than a support

The description of the characteristic deformity (Calcaneo-Cavus) with or without lateral displacement applies of course to those cases in which the foot has not been protected by mechanical support. The object of such support as applied in the more common forms of talipes in which the anterior muscles are involved is simply to prevent toe drop but in the class under consideration the brace must be strong enough to withstand the strain of locomotion therefore so heavy as to be burdensome and if lateral distortion is present satisfactory adjustment is very difficult. As a matter of observation it may be stated that for one reason or another mechanical treatment is ineffective in a large proportion of the cases. Thus one more often sees the extreme degrees of this deformity than of other types among patients of the better class.

The objects of operative intervention in cases of this character are to restore symmetry and to increase the stability and the resistance of the foot so that light and simple apparatus may be effective in all cases and unnecessary in those of the most favorable type.

Before calling attention again to the operation which was described by me six years ago (*Am Jour Med Sciences* Nov 1901) which has now been thoroughly tested and somewhat improved it may be of advantage to enumerate other procedures that have been employed in order to illustrate by contrast its relative efficiency.

*First*—Reduction of deformity by force combined with division of contracted parts. This is of course preliminary to any further procedure. It is usually ineffective in advanced cases because of the absence of resistance against which the force may be exerted.

*Second*—Willett's operation of shortening the Tendo-Achillis and sewing it to the neighboring parts with the aim

of opposing the resistance of the shortened tissues to the deformity, may be of value if the calf muscle retains a portion of its power, which may act to better advantage on the shortened tendon. In other instances, if the strain of locomotion is removed by the constant use of a proper brace, the resistance may lessen the deforming influence of the muscles on the anterior aspect of the leg. From the curative standpoint, even in the sense in which the term must be used in speaking of incurable weakness, it is ineffective, and if calcaneus is complicated by lateral distortion, it is contra-indicated.

*Third*—Hoffa has performed the reverse of Gleich's operation for flatfoot, namely by sawing through the posterior extremity of the os calcis and displacing it upward and backward, to restore the projection of the heel, the tendo-Achillis being shortened to the desired degree. This operation has the advantage over the last that it improves the contour of the foot in addition to shortening the tendon.

*Fourth*—Tendon transplantation. It is of interest to note that this operation was first employed for the relief of calcaneus by Nicoladoni, who attached the tendons of the two peronei muscles to the tendo-Achillis, with the aim of restoring its lost function. The futility of such a procedure is indicated by comparing the weight of the calf muscle (277 gms.) with that of the two muscles (40.5 gms.) that replace it, which are from their oblique direction subjected to still further mechanical disadvantage. Furthermore, as has been pointed out by Lorenz, the removal of the principal abductors is almost inevitably followed by varus deformity. It would appear then that the benefit of transplantation must be explained by restraint of unopposed muscular action, and that it is quite inefficient to prevent the deformity induced by functional use.

*Fifth*—Arthrodesis. This operation is from the curative standpoint more hopeful than the others that have been mentioned, because firm ankylosis should prevent deformity and render bracing unnecessary. Unfortunately in childhood, when the bones are undeveloped, it is difficult to attain, even when the adjoining tarsal joints below and in front of the

ankle are included in the operation. Even firm ankylosis may not be sufficient to restrain deformity of the yielding bones during the growing period. Finally the chances of success are lessened by deformity especially of the lateral type. It would seem then that the operation is most likely to be successful in those cases of simple calcaneus in adolescents in which the secondary deformity has been prevented by the use of braces.

One may sum up this criticism in the statement that each of the procedures has a certain merit in certain cases particularly of the mild type a class in which the brace treatment is a practicable alternative and that the relative inefficiency of each becomes more apparent with the degree of deformity and disability. In cases of the advanced type there is no such alternative if an operation can assure the removal of deformity and its subsequent prevention at least as far as lateral distortion is concerned.

In the analysis of the deformity the adverse leverage of the foot must be considered. The calf muscle whose loss is the cause of the disability in the exercise of its function has to contract with a force four or five times as great as would be required under equal conditions its strength according to Fick being about three times greater than of all the other leg muscles combined. This normal adverse leverage is estimated by comparing the distance from the centre of the ankle joint to the attachment of the tendo-Achillis with that of the metatarsophalangeal articulations. When the calf muscle is paralyzed the passive leverage or tendency toward deformity is increased by the loss of the projection of the heel and by the sole of the shoe which projects beyond the bearing surface of the fore foot.

The centres for abduction and adduction of the foot are the joints below and in front of the astragalus and if one or more of the controlling muscles is paralyzed lateral deformity follows. The insecurity caused directly by the paralysis and the distortions induced by use is exaggerated by the upright position of the os calcis which increases by at least a third the distance from the ankle to the bearing surface of the heel.

From this description of the mechanism of the deformity and of the attendant disability, it should be evident that the first step toward security must be the removal of the astragalus in order that the leg bones may rest securely on the solid part of the foot. The removal of the astragalus will permit backward displacement of the foot, thus the adverse leverage may be lessened or neutralized, while the restoration of the projection of the heel and the lowering of the malleoli to their proper level incidentally restore symmetry both as to the cavus and the lateral distortion. Further details in the operation are the adjustment of the malleoli and the tarsal bones in their new relations. The peronei tendons are usually divided and attached to the os calcis and the elongated tendo-Achillis is shortened to the required degree. The complete operation must be described as Astragalectomy and backward displacement of the foot (the essentials) combined with arthrodesis, tendon transplantation and tendon shortening, the accessories.

As this title is manifestly too cumbersome for use the procedure is usually classed under the author's name in the hospital records.

The steps of the operation are as follows. An Esmarch bandage having been applied, an incision is made from a point about one inch above the external malleolus midway between it and the tendo-Achillis, passing downward to the attachment of the tendo-Achillis, forward below the extremity of the malleolus and over the dorsum of the foot to the external surface of the head of the astragalus. The sheaths of the peronei tendons which are exposed at once, are opened throughout their entire length and the tendons, divided as far forward as the incision will permit, are thoroughly freed from all the attachments behind the malleolus and are drawn backward. One next divides the bands of the external lateral ligament, and the foot being somewhat adducted, the interosseous ligament is separated. On further inversion, the tissues being retracted, one may with scissors free the head of the astragalus from its attachments to the navicular, and forcibly twisting it outward, break off the cartilaginous margin to

which the internal and posterior ligaments that cannot be reached are attached. One then prepares the new articulation. A thin section of bone is removed from the lateral aspect of the adjoining os calcis and cuboid bones and from the internal surface of the external malleolus which may be further shaped to secure accurate apposition. The same but more difficult procedure is undertaken on the inner side. One separates the internal lateral ligament from the malleolus sufficiently to permit the complete backward displacement then removes the cartilage from its inner surface. With the periosteal elevator the strong inferior calcaneo navicular ligament is detached sufficiently to permit the malleolus to sink in behind or to slightly overlap the navicular. Often the sustentaculum tali must be cut away to provide sufficient space for the broad shallow internal malleolus. The two peronei tendons thoroughly freed from their attachments about the fibula are then passed through the base of the tendo-Achillis and sutured to it and to the os calcis as well at a sufficient tension to hold the foot in moderate plantar flexion. The tendo-Achillis is usually overlapped and sutured as an aid in restraining deformity. The Esmarch bandage is then removed the part is thoroughly cleansed with hot saline solution and the bleeding points are ligatured. The wound is closed with continuous catgut sutures reinforced at several points with silk. The foot then carefully supported in its attitude of backward displacement and moderate plantar flexion with the malleoli fixed by slight pressure in their new relations is thickly covered with sterilized sheet wadding and fixed by a light plaster bandage particular care being taken to exert only the slightest constriction. The leg is then brought to a right angle with the thigh and the plaster bandage is continued over the thigh reinforced by a band of steel in the popliteal region. The limb is then suspended for several days or a week the aim being to relax tension and to lessen the oozing.

It may be noted that the essential modifications of the operation as originally described are first that the cartilage is no longer completely removed from all the exposed bones



for as free motion always persisted it appeared to serve no purpose, while it increased the oozing, which if persistent interferes with rapid repair. Second, the more careful adjustment of the malleoli to their new position and the separation of the tissues attached to the internal malleolus and to the navicular bone to facilitate a complete backward displacement. Other variations have been tried, for example, lessening the thickness of the external malleolus if it appeared to project noticeably, sewing the external malleolus to the cuboid bone, splitting the tibia from below and forcing the anterior part forward to oppose a ridge of bone to the tendency to dorsal flexion. The above and like modifications are all of doubtful utility.

In cases of simple calcaneus the tendon of the tibialis posticus is sometimes transplanted to counterbalance the loss of the peronei.

The plaster bandage fixing the limb in flexion remains for several weeks until immediate repair is complete. It is then replaced by one that reaches only to the knee, holding the foot in the desired position of plantar flexion, the sole being made level by the insertion of a wedge of cork. The plaster support is worn for several months, the longer the better, since the patient must bear weight on the front of the foot until the adjustment and the formation of the new articulation are perfected.

Incidentally, the patient should be trained in the proper use of the foot, so that the equal gait may be restored. Although the cartilage is removed from the malleoli, ankylosis never follows. At best, there are fibrous adhesions that fix the parts in the improved position. The power of the transplanted muscles now exerted directly on the heel, although in no sense replacing that of the calf muscle, is sufficient under the new conditions to offset the deforming influence of the dorsal flexors, and in the absence of overstrain to hold the heel in proper position.

The after treatment will depend in great degree upon the resistance opposed to passive dorsal flexion and upon the



Tip 1 eo lg d th d lp tlt g h pth t ph t calf d h  
 h g th t fth l l S Fig 4

FIG 2



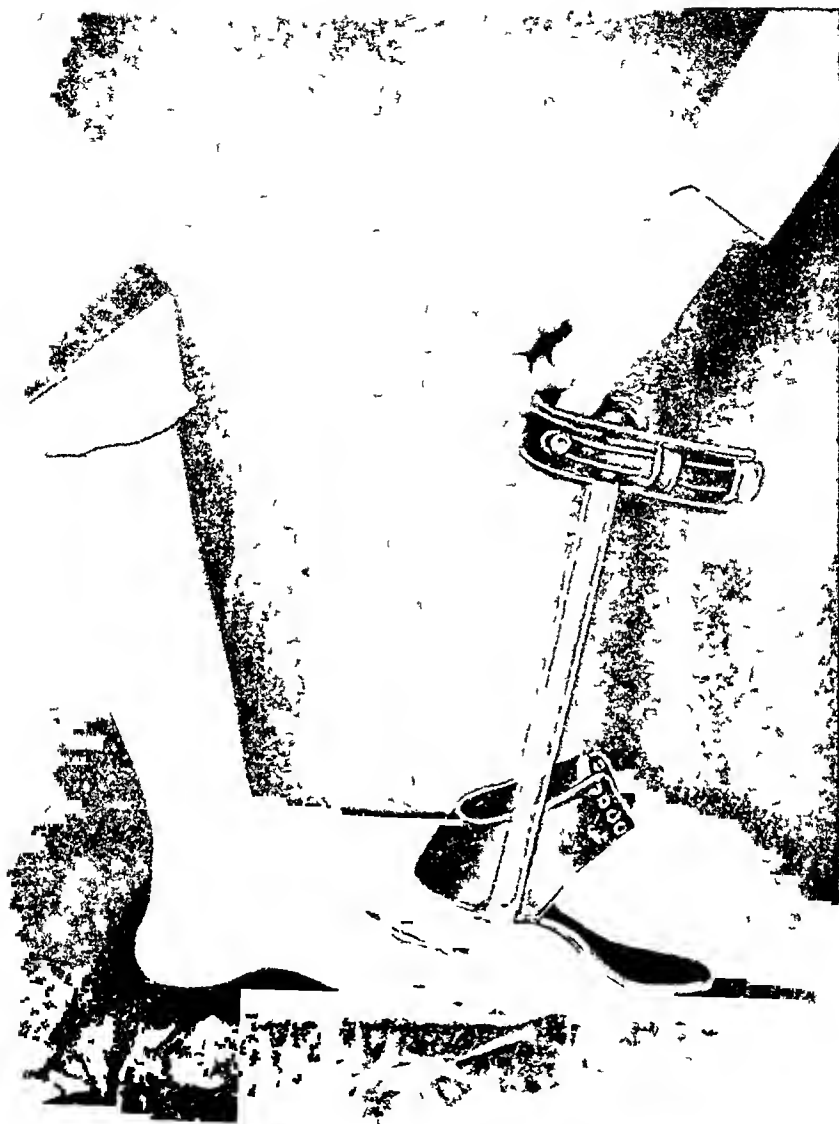
An X-ray picture of a foot after the author's operation, showing the changed relation of the leg and foot

FIG 3



Th m it d f fi gth f t pl fl f th pe t by th  
pl t b d g d w d g

FIG 4



The foot after operation and a simple brace to be worn within the shoe See Fig 2

strain to which the occupation of the patient is likely to subject the foot. In the adolescent class if the limb is considerably shorter than its fellow, as for example when the paralysis involves the thigh muscles, a so-called extension shoe is a satisfactory and easily adjusted support. In cases in which shortening is slight a wedge of cork or other material within the shoe may be sufficient. Massage and proper exercises to improve the nutrition and to develop the muscles are of course of value.

In cases treated under ordinary conditions a light strong brace without joint at the ankle is worn within the shoe to hold the foot in moderate equinus. When this is rusted or broken support is usually discarded.

In a large proportion of the cases examined for later results apparatus had not been worn or had been discarded yet the condition was very satisfactory. In no case was there valgus deformity. In several instances slight varus caused apparently by transplantation of the peronei was present and in two cases of the dangle foot class it required correction. This would indicate that in certain cases of simple calcaneus transplantation of the tibialis posticus tendon might be of advantage. If however the external malleolus is forced well forward the degree of varus can be but slight and the cases in which valgus deformity was originally present it is rather an advantage than otherwise. In other instances the foot was habitually used in slight permanent dorsal flexion but it was secure and symmetrical as regards prominence of the heel and depth of the arch. On the other hand there were cases in which the muscular power was so well balanced and the gait so nearly normal as to almost merit the patient's verdict of cure. In cases in which support was used it was comfortable, easily adjusted and effective. In all cases the result was satisfactory to those immediately concerned, the improvement in the circulation of the limb and in its appearance being generally remarked.

Results such as these obtained under the unfavorable conditions of hospital practice should be improved in the

future by the more accurate adjustment of the parts in their new relation as in more recent cases, and still more if after-treatment and proper supervision may be assured as in the more favored class

Talipes of the calcaneus type is comparatively uncommon and the operative method that has been described is still novel Hioffa states, in the last edition of his text book, that he had employed it and that the results were "ausgezeichnet," but this is the only comment that has come to my notice

As I have performed the operation in at least forty cases and have had opportunity to contrast the condition of the patients before and after treatment, I shall present and answer the criticisms that have occurred to me and which are, I assume, those that are likely to be made by others

*First*—The removal of the astragalus shortens the limb

*Second*—The operation is of a more serious character than the disability warrants, or the results justify, if a brace must still be worn to restrain deformity

*Third*—The operation may be indicated when lateral displacement is present, but it is not essential for simple calcaneus and it is not indicated when the characteristic deformity incidental to functional use (cavus) is not present

The first objection may be answered by the statement that the removal of the astragalus is essential to the restoration of symmetry and to the attainment of security In comparison, the slight shortening, practically never more than half an inch, is of no importance Furthermore, the characteristic deformity of calcaneus lengthens the limb and the removal of the astragalus, which simply restores symmetry, shortens the limb only in the sense that reduction of equinus deformity shortens it, that is, if the limbs were of equal length there would be no shortening whatever Finally, in characteristic calcaneus the fore foot is habitually above the level of the heel and plantar flexion of the foot is restricted or lost, but the space gained by the removal of the astragalus enables one to fix it in plantar flexion to the desired degree, thus to lengthen the shortened limb directly and to permit the application of the

compensating extension shoe or brace which before was impracticable

The second question has been answered in part already that after the correction of deformity a light and simple support may be efficient which before the operation would have been useless. The operation is it is true somewhat difficult and the danger would be increased by prolonged manipulation and injury of the tissues. The first should be unnecessary to one reasonably familiar with the anatomy of the part and there is no necessity for violence as no attempt need be made by wrenching or otherwise to change the shape of the foot. Finally the ease with which the wide wound may be drained should in the event of infection make the treatment simple as compared for example with arthrodesis. In my own experience I have not had cause for anxiety in any of the cases.

As to the third criticism. It is true fortunately that contrary to the rule the operation is relatively most effective in the cases in which deformity and disability are most extreme. In my opinion for the reasons given it is indicated in all cases of lateral displacement and in all cases of calcaneus in which the characteristic cavus is well marked.

If deformity has been controlled by braces and if supervision and protective treatment can be assured the operation may be deferred until the indications are clearer.

Fortunately as has been stated the more extreme the distortion the more satisfactory will be the result. It is this class only that surgeons are likely to encounter and to them this operation is again presented with the assurance gained by an extended experience.



## THE TROUGH-SUSPENDER FOREARM SLING.

BY W C WERMUTH, M D,

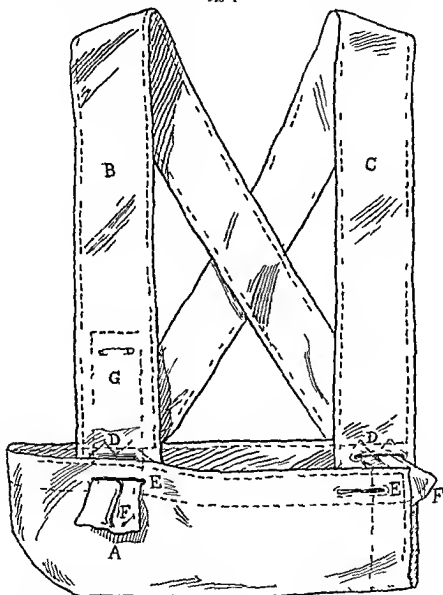
OF CHICAGO, ILL

Surgeon to the German Hospital

AN easy, comfortable, yet efficient arm sling has ever been a desideratum in the arm sling-immobilization work of arm, clavicle and chest surgery. Surgeons are familiar with the standing inconveniences of the more or less complicated soft bandage arm sling immobilization following traumatism and operations, the inconveniences of the plaster, the discomforts of the plaster Paris bandage, its weight, excoriations, difficulties in application and reapplication, the familiar irritating pressure of the old arm sling upon the lig nuchae and cervical tissues, especially when cervical cellulitis is present as from carbuncles, boils, sloughing glands, and other inflammatory and painful reactions. In children, it is especially difficult to obtain a secure comfortable and easy immobilization. The object of the present communication is to call attention to the advantages of a sling made in the form of a suspended trough. Though simple in form and principle, this sling is rich in security, ease and comfort. It may be made of any size. The one I describe here is of the medium size, still so far as size is concerned, any dimensions will serve, so long as proportion and principle remain the same. The sling is made of a strong muslin cloth. It is made of three pieces. The main or body piece is formed out of a square piece of such cloth, with dimensions 18 by 18 inches, once folded together, open above, sewed together at one end, rounding its lower border, giving to this body piece the form of a trough with one end open. (See figure I, A.) The open edges are reinforced by a one and a half inch hem. To the main or trough piece is sewed two suspensory slings, (B and C), each 42 inches long,  $3\frac{1}{2}$  inches wide at proximal end where they are stitched to the upper

margin of the inner or body wall of the trough piece. These slings taper to a  $2\frac{1}{2}$  inch wide distal end (F). The attachment of these sling pieces to the body piece the one 3 inches from the elbow end and the other flush with the free or

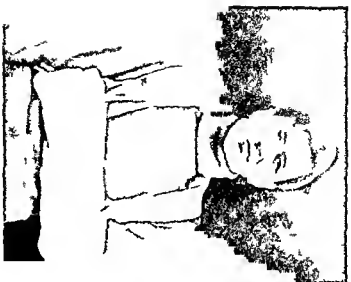
FIG 1



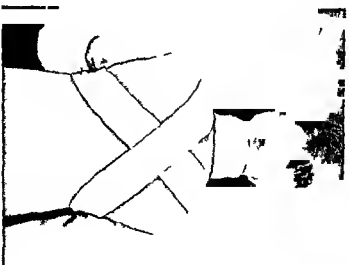
This gives the suspender forearm sling (A) the shape of a trough piece of forearm  
 (B) Support sling (C) Support sling (D) and (E) Position of the hand  
 (F) Tapering part of the sling (G) Suspended sling fixed to  
 a device to fixate

carpal end, is likewise reinforced by an inch and a half hem. Through this reinforced attachment on each side is made an opening (D), a buttonhole, also reinforced and large enough to pass the distal extremity of the suspensory sling. Likewise in the upper margin of the outer wall of the body piece, two buttonholes are made (E) directly opposite the former two to receive these distal ends. The distal (F) ends pass through the buttonholes of the walls of the trough piece and drawn taut as occasion demands securely lock and fix the arm sling. Illustrations show the forearm at right angles. Should occasion demand any other angle, the inclination or declination can be changed by shortening the pin fixation (G) on the one sling and elongating that of the other side to corresponding degree. By reversing or turning the body piece of the sling inside out, it adapts itself to either side of the body, viz, so that the suspender sling wall is in juxtaposition with the body.

*Application*—Following the dressing appropriate to the injury of the part, whether of traumatic or operative nature, the forearm is placed in the body piece of the sling, so that the elbow approximates the closed end of the trough. Then, each suspensory sling is raised over the corresponding shoulder. (See figures I and II.) Next, they are brought down crossing each other in typical suspender fashion over the back of the chest, that each distal end may pass down to and through the buttonhole of the other side. (See figure III), the end further passed through the buttonhole on the other wall of the trough and the suspenders drawn taut, the arm sling is thus locked and made firm. The ends of the suspenders are folded up against and pinned to the suspender of the proximal side (G). This fixes the sling, giving it a firm purchase without discomforts of any nature, prevents swaying or other undue or inconvenient motion. In children, this solidity of fixation proves of inestimable advantage, in securing against the annoyances and dangers of escaping parts. Instead of pins in the first models, buttons were used, but the buttons were discarded because of



A 1 w l m l e p p l d t f f  
 b l l f r a l l l l d c r f l f l  
 w r i t S l w c a y d e i f e m g l m p p d  
 f f f l l l



P 1 f m l e l d y t h m f h a  
 f f h R h d d p



possibility of infection The application of the sling is simple easy of manipulation without complications painless and secure It can be applied and reapplied its angles changed and rechanged without pain or discomfort

*Uses* —As an arm sling wherever such immobilization is desired as in fractures dislocations of the arm forearm hand and chest after burns wounds or operations for inflammations or neoplasms following operations for correction of outline or development in fractures of the clavicle a good dressing is formed by simply introducing a compress pad under the suspender sling of the affected side (See figure II )

In its use there is no dragging from weight of material no distressing excoriation from plaster skin or weather no tenderness or soreness of tissue the easy adaptability of the sling so as to overcome non neutralization of opposing muscular activities brings about a painless and perfect muscular and tissue repose

# PARTIAL RESECTION OF UPPER AND LOWER MAXILLÆ FOR CONGENITAL DEFORMITY OF THE FACE

BY ROBERT T MORRIS, M D ,

OF NEW YORK,

Professor of Surgery in the New York Post Graduate Medical School

Miss H L F , 22 years of age, came under my care at the Post-Graduate Hospital in New York, on November 22, 1905 Figure 1, from a photograph taken before operation, gives a general idea of the facial deformity The photographer was not given special instructions, and obtained artistic effects partially disguising the prognathous mandible, and leaving the deformed ears hidden A detailed description of the deformities with a view to accuracy of report, would make tedious reading, and I will give salient points only

The left superior maxilla was hypertrophic, and the right superior maxilla was atrophic Teeth irregularly disposed Nasal and lachrymal bones, vomer and vertical plate of the ethmoid bone had adapted themselves in development to correspond with the deformities of the superior maxillæ

Mandible markedly hypertrophic and prognathous, projecting more than an inch in advance of its normal frontal line, making speech difficult and closure of the mouth impossible Left mandibular body larger than the right one, and both of them about double normal breadth and thickness Teeth irregularly disposed The tip of the large nose was fairly below the right orbit, and the tip of the bulky chin was fairly below the left orbit The external ears consisted of little more than concha, antihelix and lobe, and they stood out at right angles to the head

*First Operation* —Preliminary tracheotomy, for anesthesia, and to allow packing of the pharynx Incision within the mouth along alveolar border Soft parts separated from the superior maxillæ, with care to avoid injury of the lachrymal ducts Vomer cut away from the hard palate with a thin sharp chisel Larger part of the left superior maxilla, including part of the orbital plate and alveolus with several teeth, removed with the chisel



C E I D C y f h b f h r



S E I I P U I e I p p d i w j n





A small external opening at the root of the nose allowed entrance of a narrow chisel that was used for loosening the nasal and lachrymal attachments. The loosened nose structures were then swung into the space previously occupied by the left maxillary sinus and held in place with compresses. One week later it was thought best to remove a little more of the orbital plate (operating through the mouth). Healing of the extensive wound surfaces occurred without special incident.

*Second Operation*—A segment of mandible fully three inches in length and carrying several teeth was excised. The segment included the symphysis menti and considerable more of the right body than of the left one. Excision of the segment was begun with Gigli saws but completed with the chisel as the hypertrophic bone was eburnated and it broke the saws. The remaining portions of mandible were brought together in the middle line and sutured with silver wire. This operation like the first one was done within the mouth. Repair was conducted without complications. The second part of the operation carried the point of the chin to the middle line of the face and in good line with the nose. The ponderous mass of soft tissues composing the chin and lower lip did not contract enough to give symmetry of contour to the face and about six months later I cut out the superfluous soft parts and managed to shape the lip and chin rather prettily. At the same time the protruding ears were set back by the method which we commonly employ for protuberant ears. A segment of skin and cartilage was removed from the posterior part of each ear and the cut surface was made to fit against a corresponding area above each mastoid process. The operative work in this case has resulted in giving excellent facial lines. The mouth can be closed normally and improvement of speech began very soon after the removal of the segment of hypertrophic mandible. Figure 2 from a second photograph taken recently gives a good view of the present condition of face structures.

# TRANSACTIONS

## OF THE

### NEW YORK SURGICAL SOCIETY.

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*Stated Meeting, November 13, 1907*

The President, DR GEORGE WOOLSEY, in the Chair

#### EXCISION OF THE RECTUM FOR CARCINOMA

DR CHARLES H PECK presented two patients

CASE I—*Combined Abdominal and Perineal Route*—A man, 28 years old, had complained of gradually increasing constipation, with pain in the rectum and occasionally blood and mucus in the stools, for about four months. He gave no specific history, but had been put through a thorough course of treatment with potassium iodide without improvement, and subsequently a specimen taken from the growth for examination was reported to be adenocarcinoma. When the patient was first seen by Dr Peck in June, 1907, there was a tight stricture of the rectum, the lower end of which was three or four inches from the anus. It was densely indurated, too tight to admit the finger, and somewhat fixed anteriorly.

The pain, discomfort and loss of weight had been increasing steadily, and the patient insisted upon having an operation performed in spite of the fact that the risk and uncertainty of outcome were explained to him very frankly. On July 1, 1907, under ether, the abdomen was opened by a vertical incision through the left rectus, and the patient placed in the high Trendelenburg position. The growth was felt low in the pelvis, somewhat attached to the base of the bladder in front, but otherwise free. The lymph nodes in the meso-rectum were enlarged.

The rectum was divided with a cautery between two clamps well above the growth, at the level of the promontory of the sacrum. Each cut end was closed with a continuous suture of heavy catgut, a heavy silk purse-string suture and a silk Lembert

stitch The superior hemorrhoidal vessels were ligated and divided the peritoneum at the base of the meso-rectum on either side incised and the rectum together with enlarged glands freed from the hollow of the sacrum nearly to its tip Laterally it was freed to the base of the bladder on either side and the middle hemorrhoidal vessels were ligated but anteriorly the growth was close to the base of the bladder and sufficient exposure could not be obtained to separate it from above The abdominal wound was padded off the patient placed in the lithotomy position and after dilating the sphincter cleansing and closing the anus with a heavy silk purse string suture a median posterior incision was made and the coccyx excised The levator ani was divided the hand passed up into the pelvis along the hollow of the sacrum and the closed end of the lower segment drawn out through the perineal wound Separation from the bladder and prostate in front was now completed and transverse division below the growth just above the internal sphincter effected The remaining mucous membrane of the anal segment was then excised the closed proximal end of the gut was drawn down through the sphincter and secured by heavy silk sutures to the anal margin The sutures were passed deeply into the muscular coat around the purse string and Lambert sutures which were left in place the gut not being opened Only moderate division of the peritoneal layers of the meso sigmoid was necessary to allow the closed end of the gut to be brought down within the sphincter without tension The perineal wound was then closed with deep catgut sutures several of which caught the wall of the gut for additional anchorage except at the upper angle where a large rubber covered gauze drain was carried to the hollow of the sacrum The skin was closed with continuous silk Returning to the abdominal wound the peritoneum on either side and at the base of the bladder was sutured to the gut wall with catgut closing off the peritoneal cavity completely from the wound area The abdominal wound was then closed without drainage

The operation took two hours and forty minutes hemorrhage was moderate throughout but there was some operative shock and an infusion of 1500 cc was given on the table

The segment of gut removed in the fresh state measured about six inches in the centre of which was a dense cartilaginous

ring of tumor tissue reducing the lumen to the size of the little finger. There were several hard, enlarged glands in the mesorectum.

The purse-string suture closing the gut was not disturbed until the sixth day, when it was removed and a tube was inserted into the gut. On the eighth day there was a good movement of the bowels through the sphincter. The patient was out of bed on the twenty-first day, with the wound healing kindly, and no fecal fistula, all matter from the bowel passing through the sphincter. He has continued to improve and has a moderate degree of sphincter control.

CASE II—*Perineal Route*—The patient was a woman, 45 years old, who had suffered gradually increasing difficulty in emptying the rectum, with pain and bleeding, for about seven months. Her symptoms were for a time attributed to hemorrhoids. Upon admission to Roosevelt Hospital on July 17, 1907, there was an indurated, ulcerated growth involving the anal segment, extending from the muco-cutaneous junction upward for about two inches. The posterior commissure and lower portion of the posterior vaginal wall were involved in the growth. The microscopic report on a specimen removed a week prior to her admission was adeno-carcinoma.

Operation was performed July 19, 1907, under ether anesthesia. After closing the anus with a purse-string suture of heavy silk, an ovoid incision was made from the coccyx forward, including the anus, posterior vulvar commissure and lower third of the posterior vaginal wall, as well as a wide margin of skin on either side.

The levatores ani were divided, the vaginal wall separated, and the rectum freed and drawn down until a healthy portion well above the growth was reached. A small wound in the peritoneum of Douglas' cul-de-sac was closed with catgut sutures. The gut was divided transversely about three and one-half inches from the anal margin and the edges of the proximal segment were sutured to the skin of the perineum with heavy silk. Plastic closure of the wound anteriorly, as in complete perineorrhaphy was then effected, and a cigarette drain posteriorly to the hollow of the sacrum. A rectal tube wrapped with gauze was placed in the gut. The operation took an hour and a half, and was well borne.

The bowels were not moved until the eighth day after the operation. The permeal repair healed by primary union and at the end of two weeks the wound was entirely healed except for a narrow granulating area surrounding the new anus where the mucous membrane had retracted slightly from the skin.

A noteworthy feature of the result is that in spite of the fact that the sphincter muscle was entirely removed with the growth the patient regularly goes two or three days between each defecation then takes a cathartic and has one or two movements followed by another interval of comfort and freedom from soiling. She is able to attend to her household duties and usual occupations to an extent not anticipated at the time of the operation.

The result in the two cases presented in one of which there is no possibility of even partial sphincter control is suggestive of the importance of the trap like action of the sigmoid loop if its normal mobility has not been interfered with by a previous colostomy for the degree of comfort attained by both cases could hardly be improved upon.

DR WILLY MEYER said he first wished to emphasize the wisdom of adhering to the principle of avoiding an artificial anus in these cases if possible. Whether this was feasible or not depended principally on the degree of the stricture we had to deal with. If we succeeded in the course of eight or ten days by means of repeated doses of castor oil and possibly high rectal enemata in emptying the intestinal tract fully it was of great advantage to these patients to avoid the formation of an artificial anus which at best required three operations in the case. The speaker said that in his own cases operated on by this method during the past ten years the results had been very satisfactory. He could not recall a single instance where after a thorough preparation of the patient including a restricted diet a large amount of fecal matter came down to disturb the results of the operation.

The speaker referred to the difficulty in some of these cases of removing the glands in the meso colon upon which the future fate of the patient might depend. In order to gain a good access to the field of operation Dr Meyer said that at the German Hospital they had adhered to the posture which was introduced there by Dr I. Lange about twenty years ago namely the knee-chest

posture, with a heavy pillow under the patient's abdomen to relieve the negative pressure. In this position the work was immensely facilitated, and it revealed a good view of the rectum and sigmoid. He usually made a wide incision into the peritoneum, and then followed by means of the double ligature the gut up to the meso-sigmoid, making it as movable as possible. He had been amazed in a number of instances to see how far-reaching ligation of the meso-sigmoid was possible in order to render the sigmoid movable and yet not get subsequent gangrene. He had never seen gangrene of the end of the sigmoid occur, except after Witzel's operation, when the gut is pulled through a lateral incision.

The speaker emphasized the importance of safely securing the cut ends of the gut. It was attention to this that rendered the operation aseptic. A method he had followed was to divide the muscular coat of the rectum down to the mucous membrane, being very careful not to open the latter, and then tie the mucous membrane tightly with an ordinary ligature, then dividing the rectum between the clamp and ligature, and leaving it to nature to let the ligature cut through. This process usually required three or four days, and by that time the danger of infection had passed.

DR ANDREW J McCOSH said the excellent results obtained by Dr Peck in the two cases shown should rather encourage surgeons to perform more frequently radical operations for cancer of the rectum. On account of the bad results that had been reported, fewer of these radical operations were probably done at the present day than were done ten years ago. In spite of that, quite a goodly number of cases that had remained cured for five years or longer could probably be placed on record by various members of the Society.

Dr McCosh said that in his own practice he had never resorted to a preliminary inguinal colostomy in these cases, nor could he see any necessity for or advantage in doing so. The results, so far as cleanliness was concerned, which followed complete extirpation of the rectum after the sphincter muscle had been entirely removed, were as a rule rather disappointing and disagreeable. Still, he recalled one case where that operation was done fifteen years ago, the entire rectum being extirpated, together with the sphincter muscle, and the patient seemed per-

fectly satisfied with the result and was able to keep himself comparatively clean. His practice was to wash himself out in the morning and there was very little leakage during the rest of the day. He also recalled the case of a woman upon whom he did the original operation about twelve years ago and subsequently showed at a meeting of this Society. In that case an extensive excision of the rectum had been made through an abdominal incision preserving the sphincteric part of the rectum perhaps an inch and a half of the mucous membrane being left. The gut was not pulled down but was sutured to the edges of the abdominal wound an inguinal colostomy. The patient was not satisfied with her colostomy wound and as more than three years had elapsed since the original operation the danger of a relapse being comparatively slight a second operation was undertaken. The section of the gut that was attached to the inguinal opening was brought down and stitched to the remaining segment of the rectum at the anus. At the time of the operation the woman weighed 280 pounds she now weighed 350 pounds and still remained entirely well the result of the second operation being perfect.

The speaker said that in the last three cases where he had excised the rectum and had also found it necessary to excise the sphincter he had not brought the end of the gut down to the gluteal region at all but had fastened it in the inguinal region bringing perhaps five or six inches of the gut well out through the abdominal incision and passed for this distance between the internal and external oblique muscles and fastened well outside of and below the anterior superior spine of the ileum. Two of these patients who were still under his observation were able to keep themselves remarkably clean by wearing a broad pad which effectually compressed the section of gut which lay between the internal and external oblique muscles. One of them who was operated on three years ago was an actress who was still on the stage. She washed herself out every morning with glycerine and water and remained dry until the next morning. There was practically no leakage.

Dr McCosh said that he could recall at least four cases where he could claim a radical cure after excision of the rectum for cancer. One of these was done fifteen years ago another twelve a third nine and the last about five years ago.



DR L W HOTCHKISS said he had operated upon one case of carcinoma of the rectum during the summer in which a preliminary colostomy was done for the intestinal obstruction. After the obstruction was relieved, a resection of the rectum was done for a growth which was high up in the rectum and leaving several inches of gut intact above the sphincter. In this case the approach was made by the osteoplastic sacral flap of Rydygier. The peritoneal cavity was opened, the growth was freed and the gut was brought down and resected, but by reason of the preliminary colostomy the upper segment was too short to make a comfortable telescopic anastomosis, so an end-to-end suture was resorted to. In this case the posterior wall of the proximal end of the gut had sloughed, necessitating its subsequent removal and the establishment of a permanent artificial anus through the abdominal wall.

As regarded the radical cure of cancer of the rectum, Dr Hotchkiss said he could report one case in a man 54 years old who was still alive and well over five years after a resection of gut for the removal of a high soft rectal carcinoma. The removal was made through Rydygier's perineal incision, and the patient had good control of the sphincter which had been preserved.

In extensive cases of cancer of the rectum, the speaker said he thought there was no doubt about the propriety of doing a complete removal of the lower end of the gut through the combined abdominal and perineal operation and establishing a permanent abdominal artificial anus above. Personally, he had obtained the best results in cases where the sacral operation by the osteoplastic method of Rydygier had been possible, although he was well aware that resection with preservation of the lower segment of the rectum with the sphincter was only allowable in selected cases.

DR GEORGE WOOLSEY said that while he was formerly in favor of a preliminary colostomy in suitable cases, he now preferred to make an opening in the inguinal region and establish a permanent fistula.

DR PECK, in closing, said it had occurred to him that in cases where no preliminary colostomy was done, and where the mobility of the sigmoid loop was not interfered with, the latter apparently had some influence in keeping these patients from soiling themselves.

SYNCHRONOUS LEFT URETEROSTOMY AND RIGHT NEPHROSTOMY FOR HYDRONEPHROSIS DUE TO URETER OBSTRUCTION BY BLADDER TUMOR PER MANENT DRAINAGE

DR. F. TILDEN BROWN presented a man twenty three years of age who six years ago had an attack of measles and since then at periods of from three to four months he had had attacks of pain in the bladder perineum and penis these lasted two or three hours and were relieved by a warm bath. He was examined by physicians in Germany for admission to the Army and was said to have had pulmonary tuberculosis. After treatment he was pronounced cured and he had had no pulmonary symptoms since that time. His family history was negative. He gave no venereal history. All subsequent observation supports this negation.

On April 16 1907 without previous symptoms he was suddenly awakened by a severe suprapubic and perineal pain radiating to the tip of the penis. Urination was very difficult and accompanied by much blood. The pain was severe and persistent requiring hypodermics of morphine. When he was admitted to the Presbyterian Hospital on the same day he was still having severe pain and was passing small amounts of bloody urine voluntarily and involuntarily. A catheter was introduced and twenty ounces of bloody urine withdrawn. Examinations for stone and X ray exploration of the kidneys and bladder were negative.

Repeated tests for tuberculosis of the genito urinary tract were negative. Physical examination showed tenderness and rigidity over the bladder region. The prostate by rectal examination appeared normal except at its upper limits and the tissues beyond.

Three days after admission the patient had a similar attack with pain referred to the tip of the penis and followed by bloody urine. Four days later a more thorough examination revealed a larger mass per rectum. It was just above the prostate hard irregular and tender seemingly involving the posterior bladder wall and seminal vesicles. A cystoscopic examination made by Drs. McWilliams and Osgood showed a large sessile hemispherical tumor with an irregular and ulcerated surface involving the base of the bladder encroaching upon the ureters especially

the left, and extending to the lateral aspects of the bladder. The patient's general condition grew worse, his pain was more severe, radiating down the thighs and most marked in the flanks in each kidney and ureter region. It was evident that both ureters were at times obstructed, and that this intermittent hydro-nephrosis was the cause of principal suffering. An operation for its relief, and in anticipation of a subsequent radical operation on the bladder, was offered, wherein a renal outlet would be provided for in each ilio-costal space.

On April 27, 1907, with the patient prone on the face and large supports under the abdomen to lift and extend the loins, the left kidney and ureter were exposed, and the latter was ligated and cut and stripped from its peritoneal attachment five inches below the kidney. The severed ureter was then brought to the surface and fastened by means of chromic sutures to the skin. A small soft rubber catheter was inserted to the renal pelvis and secured to insure drainage and prevent the wound from becoming soiled. The wound was then sutured and a superficial cigarette drain inserted.

The right kidney was then operated on. Here the ureter was left intact, and a nephrostomy done by blunt scissors passed into the pelvis through the cortex and parenchyma from the convex border just below its middle. An angled, soft rubber catheter was pushed through this kidney wound into its pelvis for drainage. About two weeks after the operation there was a profuse discharge of most offensive necrotic material from the bladder through the urethra, and the tumor previously felt by rectum seemed smaller but still with resisting, undulating wall. Irrigation of the bladder gave evidence of extensive breaking down of tissue. From the first, and ever since, the drainage from the left kidney has been more satisfactory than that from the right, *i e.*, the side on which the catheter entered the renal pelvis through part of the ureter. For four or five weeks some of the right kidney urine found exit through the ureter, bladder and urethra, subsequently all drainage ceased by the bladder and the urine was drained through the nephrostomy wound by means of the right-angled catheter, held in place by adhesive, and led into one of the two bottles suspended on the flanks from the shoulder. Later, the bottles were suspended in front, just above the groin by means of a sling about the neck. This

again was subsequently improved by using a long rubber receptacle suspended from the pubic region and worn inside the leg of the trousers to the top of which was fitted a hard rubber nut into which was screwed a metal Y shaped tube to the upper branches of which the catheters were attached. This apparatus perfected and adjusted by Dr. Keator was suspended by webbing from the neck and held to the body by a belt of the same material about the hips. The drainage was perfect and management of the single large urinal was much easier for the wearer than any of the former devices. At night the patient connects each catheter with a short tube entering a bottle on each side of the bed. The bed clothes are not even moistened by any leakage. No urine is passed by the bladder. The catheters are removed every second day and fresh sterilized ones inserted.

A cystoscopic examination made on July 21 1907 showed that the bladder would tolerate only two ounces of fluid greater distention was very painful and a complete disappearance was noted of the tumor previously seen. There was no ulceration but outside of the left ureteral orifice there was a dark area of depression suggesting the former site of part of the tumor. The left ureteral mouth looked normal. The right one was surrounded by a slight hyperemic and elevated zone and there were several places on the base of the bladder which suggested small healed ulcers. A rectal examination showed some thickening of the bladder floor above the prostate. The patient is now in good health he has gained in weight and has had no discomfort from the apparatus excepting that incidental to the dressings.

There remain several interesting considerations in the future management of this case the most important being a diversion of the right kidney urine to the bladder again through the intact right ureter and closure of the nephrostomy sinus. The fact that the etiology and exact point of origin of the tumor are still undetermined makes it seem advisable to defer yet awhile any change from the existing satisfactory condition. But in anticipation of this restitution of normal right side urinary functions vesical irrigations have been commenced with the hope that distensibility and contractility of this viscus may be regained and ready to be utilized.

In this patient as with a former case of nephrostomy it was found that the only certain way to determine with an instrument

that the renal pelvis was accurately occupied by the drainage catheter was to slit the ureter near the pelvis for insertion of delicate curved forceps which was then pushed through pelvis or central calyx and on through parenchyma and cortex here to grasp the catheter and draw it back into the pelvis. Removing forceps to suture the ureteral slit. The kidneys in these nephrostomy cases are apt to have normal pelves, small, collapsed envelope-like spaces, gaining an instrumental entrance to which from the surface of the kidney is fraught with uncertainty. The instrument is as apt to bring up at the hilum *outside* the pelvis walls, as *between* these two closely opposed surfaces. The finger, of course, might be a reliable guide, but kidney puncture by so large an object is unnecessarily damaging.

### TUBERCULOSIS OF THE TESTIS

DR F TILDEN BROWN presented a man, 34 years old, a machinist by occupation. His immediate family history was good, but four of his uncles had died of pulmonary tuberculosis. He had formerly used alcohol to excess. When he was nine years old he had an attack of hematuria lasting one day, for which no cause could be assigned. About that time he was said to have had repeated attacks of malaria. When he was thirteen years old he began to lose flesh, and developed a cough, with bloody expectoration. He was sent to the country for four months, where he gained decidedly in weight and strength.

Ten years ago the left testicle became swollen, red and painful. Within a month it broke down and discharged, the sinus healing in three months without any treatment. The testis, however, still remained swollen and tender, and three months later it broke down again. At that time the patient was having frequent night sweats, he felt weak and was losing weight. The testis was curetted with good result.

On August 15, 1907, "after a heavy lift," the right testis became swollen, but not painful. It was five inches in length and three and a half inches in diameter. It subsequently broke down and discharged, leaving a circular ulcer. The patient still had night sweats at irregular intervals. He was admitted to Bellevue Hospital on October 8, 1907. His temperature at that time varied but little from the normal. The main interest then was a differential diagnosis between gummatous, cancerous, tuberculous ulcer

and ulcer due to chronic localized urinous infiltration. While the history and state of the contained organs was almost enough in itself to justify the diagnosis of tuberculous ulcer of the scrotum secondary to that of the epididymis and testis the appearance unusual size and hard induration of the margins was much more suggestive of epithelioma. As had been his experience in the majority of such cases tubercle bacilli were readily found in the discharge.

*Operation*—A complete removal of all the tissue involved guarding against any chance of soiling the new surface was aimed at. The testis was pretty completely infiltrated but with a later development of tuberculosis than that in the epididymis. The vas was not involved at the point of severing the cord.

#### FURTHER OBSERVATIONS ON THE TREATMENT OF PARALYTIC TALIPES CALCANEUS BY ASTRAGALECTOMY AND BACKWARD DISPLACEMENT OF THE FOOT

DR. ROYAL WHITMAN read a paper with the above title for which see page 264.

In connection with his paper Dr. Whitman presented a number of patients upon whom he had performed this operation.

DR. F. TILDEN BROWN said that the theory upon which Dr. Whitman had based his operation appeared to him as wise. The speaker said that some years ago he was impressed with the comparatively insignificant functional importance of the astragalus by the case of a young man who was thrown from his horse receiving a severe injury of the lower leg including a Pott's fracture and a dislocation of the astragalus. Dr. McBurney urged removal of the bone. This resulted in scarcely noticeable shortening. The patient made an excellent functional recovery and in comparatively short time was able to play tennis, ride and dance about as well as before.

DR. WOOLSEY said the cases demonstrated by Dr. Whitman were certainly excellent especially when we had in mind the severe type of deformity from which these patients had suffered. It was remarkable with what impunity the astragalus could be handled. The speaker said he had removed the bone several times to correct the deformity resulting from equinovarus but he had never done the operation in talipes calcaneus.

## DOUBLE CASTRATION FOR TUBERCULOSIS

DR JOHN A HARTWELL showed specimens removed from a boy, aged seventeen years, Italian, who was admitted to Bellevue Hospital on July 18, 1907, with a well-advanced tubercular disease of the elbow. This was operated on by Dr Hitzrot, a radical resection being done. The post-operative progress was slow, but satisfactory until about September 1st. At this time the reparative process came to a standstill and the soft tissues in the neighborhood of the joint began to break down with tubercular infection. At the same time his general condition began to fail. On September 6th all the tubercular disease was curetted out by Dr Hartwell and the cavities drained. The patient was then put on treatment with bacillen emulsion Koch, made by killing the tubercular bacilli by heat, grinding them in a mortar and making a watery suspension of them. He received the following dosage, expressed in weight of the powdered bacilli: September 6th, 1-5000 milligram, September 11th, 1-5000 milligram. This gave no local or general reaction. September 17th, 1-2000 milligram, producing a considerable reaction, rise of temperature, and general malaise. September 20th, 1-2000 milligram, with again marked reaction. Following this last injection he complained of pain in the left testicle, examination of which showed it very much swelled, tender and adherent to the skin, both testicle and epididymis being involved. Careful questioning failed to elicit any knowledge on the part of the patient of any previous diseased condition of the organ. It was apparent, however, that it was the seat of a well-advanced tubercular process. Accordingly on September 21st castration was done by Dr Hartwell, the incision being extended up through the whole length of the inguinal canal. The vas was then found to be diseased throughout its whole length, as was also the seminal vesicle. Incision was therefore enlarged upward, the deep epigastric vessels tied and cut, and the anterior sheath of the rectus freely incised transversely. The traction of the wound thus made gave ample exposure for the removal of the whole of the vas and the vesicle. Palpation through the bottom of this wound showed the prostate and opposite vesicle to be involved. The right testicle and vas, however, were apparently free from any involvement. The post-operative course was very satisfactory, the deep wound healing very rapidly. On

October 12th he received 1-50 000 milligram of the emulsion and on October 15th 1-25 000 milligram. This was followed by marked reaction and swelling in right testicle. Rest in bed strapping and local treatment had no effect on this local inflammation. Accordingly on November 5th the above operation was repeated on the right side by Drs. Dennis and Hitzrot. An examination of the specimens removed showed the following conditions. Left testicle epididymis vas and seminal vesicle are all the seat of advanced tuberculosis with extensive caseation. The right organs show a much less marked process in the vas and testicle but an exactly similar condition in the vesicle. The condition in the left testicle was very evidently an old affair which was apparently started into renewed activity by the vaccine treatment. It will be noted however that on September 17th the dose of 1-2000 milligram gave a strong reaction and that this was followed on September 20th before the reaction had subsided by the same dosage. This was an error inasmuch as overdosing with the vaccines is known to be harmful. In the case of the right testicular involvement the dosage was more carefully regulated and still the marked reaction occurred and persisted. It would seem therefore that the bacillen emulsion must be used with extreme caution to avoid the harmful lighting up of quiescent processes. In spite of the setbacks the boy received his general and local processes both in the elbow and in the genital tract seemed to be much improved by the use of the vaccine. Dr. Hartwell presented the specimens as a matter of record in the vaccine treatment of surgical tuberculosis and also as a matter of interest which they afforded in the case with which vesiculectomy may be done through an inguinal incision. He wishes to express his appreciation of the courtesy of Drs. Dennis and Hitzrot in putting their notes of the case at his disposal.

DR. WHILY MEYER said that while in a case like the one reported by Dr. Hartwell where the testis and vas and seminal vesicle were involved a thorough operation like the one performed was clearly indicated he wished to call attention to a more conservative method of treatment in cases where one testis had been removed for tuberculosis and the second subsequently became diseased. With no involvement of the prostate or vas deferens we had a clear ascending tuberculosis of the genital tract and in those cases especially in younger patients Dr. Meyer said



he wished to say a word in favor of Bier's hyperemic treatment. He recalled the case of a young man of nineteen who about ten years ago had one testis extirpated for tuberculosis, the second organ subsequently became involved, and the patient begged to retain it, if possible. Bier's hyperemic method of treatment was instituted and faithfully carried out for a long time, and now he was cured so far as the tuberculosis was concerned, although the epididymis was still slightly enlarged. Quite a number of such cases were on record. This case was shown before this society about six to eight years ago. The treatment, which could be carried out by the patients themselves, was indicated in those cases where the one remaining testicle became affected by tuberculosis.

#### KIDNEY BOARD AND ARM GALLOWES

DR F TILDEN BROWN demonstrated a later model in thin steel of a huge hinge, which was shown a year ago when made as a folding wooden board. The purpose of the apparatus is that of making a good surgical exposure of the ileo-costal space in kidney operations, when placed under the opposite region, where its degree of elevation is controlled by crank. In operations on gall-ducts and bladder also, its easy introduction under the dorsal spine makes it useful.

Dr Brown also showed an adjustable gallows for slinging the superimposed arm when the patient is on the side. Relieving the chest of the shoulder and arm weight, besides favoring comfortable anesthetization, it serves as a prop to prevent the patient's thorax and trunk twisting forward.

# TRANSACTIONS

OF THE

## PHILADELPHIA ACADEMY OF SURGERY

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*Stated meeting held November 4 1907*

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### ESOPHAGOTOMY FOR IMPACTED COIN IN A NINETEEN MONTHS OLD INFANT

DR CHAS F NASSAU presented a child who had been referred to him by Dr Bridgett of West Philadelphia on account of a suspicion that the child had swallowed a five cent piece. She was not particularly ill for a while but she could take only liquid food even soft potato being vomited. Shortly the child had a quite serious gastro intestinal upset as it was supposed. When she was finally brought to Dr Nassau he had an X ray plate made which showed the nickel piece lodged in the esophagus just above the suprasternal notch. On the following day the twelfth after the swallowing of the nickel the child was admitted to St Joseph's Hospital. Dr Nassau passed esophageal forceps readily down the esophagus and could feel them strike a metallic object but he was not able with some little pains to grasp this object. Considering the length of time this foreign body had been imbedded in the child's esophagus he thought it wisest to do an esophagotomy rather than try to force the nickel out. The operation consumed but fourteen minutes and there was little trouble about the operation. There were no vessels requiring ligation the wound was closed after the introduction of a gauze drain without suturing the esophagus. The nickel lay in the anterior portion of the esophagus with the edge turned up a little toward the left and spanning it tightly as though in a pocket. There was no leakage of either fluids or food and the child made a perfectly uninterrupted recovery.

Dr Nassau also referred to a second recent case. The patient a physician swallowed a set of caps and pivot teeth at

3 A M , and the operation was performed at about 9 30 following, there being no question about attempting to remove them by any other method The patient had a rather stoutish neck which it was impossible to stretch out quite as desired The operation was performed in a country house and took about twenty minutes This esophagus was sutured and the entire lower half of the wound was drained The pack was inserted for about  $4\frac{1}{2}$  inches, which Dr Nassau afterwards considered extremely wise as the wound was badly infected within two days This wound is now very well cleaned up, there being healthy granulation and no leakage Any kind of liquid food can be swallowed without pain

DR WILLIAM J TAYLOR stated that in 1900 he operated upon a child of 16 months who had swallowed a good sized metal clip This was in the child's throat for seven months It was a nursing baby and therefore had swallowed its milk fairly well, but it was absolutely impossible for it to swallow solid food An X-ray picture was taken soon after the swallowing occurred but unfortunately the child was not etherized and the plate was a failure When the child was referred to Dr Taylor he had Dr Leonard take a skiagraph, which gave a most excellent view of this clip which was open The child was etherized, and but slight efforts were made to reach the object with instruments Dr Taylor agrees with Dr Nassau that the only safe plan when foreign bodies have been in the esophagus a long time is to do an esophagotomy This was done in his case and the child made a very satisfactory recovery and is now a strong healthy boy with no stricture of his esophagus and has had no difficulty whatever in swallowing Dr Taylor showed the corresponding clip to that which had been swallowed and called attention to its nickel-plated condition, stating that the nickel-plating of the clip which had been swallowed had been absorbed while the clip was in the child's throat

Dr Taylor desired to repeat his statement that he thought it always safest, after a foreign body had been for some time imbedded in the esophagus, to do an immediate esophagotomy rather than try to remove the object with a coin catcher or forceps

DR JOHN H GIBBON considered Dr Taylor's attitude rather radical He referred to a case in which he had removed an ordinary campaign button which had been in the esophagus for

eleven days This patient made a good recovery He thought one had to be guided entirely by the character of the body in the esophagus and by the symptoms Esophagotomy carries with it a certain amount of danger especially from pneumonia and a case in which an esophagotomy is done in the presence of ulcers is always in danger of a pneumonia He considered it wise to make an endeavor to remove the foreign body unless the evidence goes to show that such an attempt would be dangerous He did not believe any rule could be laid down as to the performance of an esophagotomy after the foreign body had remained any certain time in the esophagus especially when the foreign body was smooth or round

DR JOHN B ROBERTS mentioned the case of an infant who had swallowed a jackstone The patient was referred to him last spring a day or two after the accident It had been seen by other physicians in the meantime Dr Roberts tried unsuccessfully to get the jackstone out by the mouth Finally an esophagotomy was done and unfortunately on account of not being able to get a guide into the esophagus he made a slight puncture in the trachea He removed a six ended jackstone from the child's esophagus The patient did fairly well for a few days but the wound finally became very septic and she died of a capillary bronchitis Dr Roberts thought that if he had seen the patient earlier and had resisted the temptation to attempt removal through the mouth and done esophagotomy earlier he might have had a better result

Last winter with an ordinary coin catcher he succeeded in removing a coin from the esophagus after it had been swallowed but a few hours

DR A C WOOL agreed with Dr Gibbon that some judgment should be exercised in adapting the method of removal to the kind of body as well as to the time that had elapsed since it was swallowed An irregular object such as a jackstone would cause ulceration more rapidly than one that was smooth and round such as a coin There is good reason to believe that it would have been dangerous to attempt to fish out the clip shown by Dr Taylor

He referred to his experience in five cases in which jackstones had been swallowed In two of these the jackstone was removed by means of a gastrotomy after efforts at removing

it through the mouth failed. The stones were brought into the stomach and removed without serious consequences, the children making normal recoveries. He had tried various esophageal forceps without success in three cases in which he was able barely to touch the jackstone with the tip of the index finger. By using this finger as a guide and employing a hook like a tenaculum, bent to the proper curve, he was able in these three cases to get the body up without difficulty and without danger to the child. He considers esophagotomy such a serious operation in itself that it should be resorted to only when all other appropriate means have failed.

DR JOHN H. JOPSON recalled several cases in this connection. In one case he was able to extract a jackstone by passing an English catheter alongside of it and withdrawing catheter and jackstone together. He has never had much success with the esophageal forceps in children. He referred to an unfortunate case at the Children's Hospital this Spring where a nickel had been imbedded in the esophagus for several days. The X-rays located it in the neighborhood of the cricoid cartilage and an attempt at extraction was made with some new instruments. The coin catcher was too large and almost became impacted. Jopson feared it would be necessary to do an esophagotomy, but on the following day his assistant brought a coin catcher from the University Hospital and with this the coin was brought out with the first effort. Dr. Jopson therefore considers the shapes and sizes of coin catchers important. This child was taken home that night against his advice, and had an attack from which it died in a few hours. The cause of death was not determined, but there may have occurred a pressure perforation of the esophagus or an edema of the glottis.

DR JOHN H. GIBBON also referred to a case which was under his care at the Pennsylvania Hospital last winter. The patient was a child four or five years of age who had swallowed a jackstone. Numerous attempts had been made at removal of the stone before her admission to the hospital. Dr. Gibbon thought he could feel the stone with the forceps but was unable to remove it. The child was anesthetized and the stone seen distinctly through the fluoroscope. This case illustrates well the advantage of the fluoroscope. This stone and forceps could be distinctly watched throughout the removal. The forceps grasped

first the smooth end of the jackstone and slipped off the stone was then turned round and the knobbed end of the jackstone caught. This was one of the most satisfactory uses of the X ray in the removal of foreign bodies that Dr Gibbon has ever experienced. This child developed a pneumonia from which she died two or three days after the removal of the stone.

DR CHARLES L. LEONARD (by invitation) referred to a case sent to him from North Carolina for examination by the X ray. The patient had been X rayed but no foreign body found. He discovered a coin in the esophagus which was finally removed with the coin catcher some 18 months after it had been swallowed. This was in a boy of twelve years. Dr Leonard also stated that it was not now necessary to make an X ray examination under ether because these examinations could now be made with exposures of ten seconds or less.

DR CHARLES F. NASSAU in closing, said there is no question whatever that when given a foreign body either smooth or a jackstone attempts may be made to extract the body. With this baby he made reasonable efforts after touching the object with the esophageal forceps which he had no difficulty in introducing. He thinks a difference should be made between bodies which have been for a comparatively short time and those which have been in for months for where an object has been in only a short time infection there is severe if it had been there for a long time Nature will have done as she does everywhere build a wall round that body which will protect the tissues outside from the extension of infection due to reasonable manipulation. He does not believe from his small experience that esophagotomy is such a serious operation as one would suppose. In the case of this child he cut no vessels while in that of the heavily built man with the plate of teeth in his esophagus Dr Nassau tied the inferior thyroid and one small branch running anteriorly from the vessel and put only two ligatures in the wound. When he opened this esophagus there was a gush of purulent material and of course with this condition present it would have been death to his patient to have attempted to remove the object by any other means. In neither of his cases could the object be felt by a finger in the throat they were both lodged in the esophagus. They could however be touched with the forceps. As to the use of a guide Dr Nassau said that after feeling the foreign

body he took out the forceps, made the incision as far as the esophagus, and then reintroduced the forceps in the case of the man, but not in the baby. The prongs and edges of the plate of teeth had imbedded themselves and sepsis was beginning at a serious rate, and he found the forceps a great aid in this condition. The patient's temperature went up that night to 104°, but on the fourth day was normal.

#### SIGMOID DIVERTICULITIS (MESOSIGMOIDITIS) IN A CHILD

DR ASTLEY PASTON COOPER ASHHURST presented a boy aged seven years and nine months, whom he had seen on the evening of July 18, 1906. In the absence of Dr Hutchinson, to whom he was indebted for the privilege of operating and of reporting the operation, he was called to the Children's Hospital to see the patient, who had just been admitted with the diagnosis of appendicitis. The patient's family history was negative, he had had measles and mumps, but not recently. For the past two weeks he had had pains in the abdomen, chiefly around the umbilicus, and not very severe until three days before admission. Then he lay on the bed, doubled up as if with cramps, but did not vomit until the day he was first seen by Dr Ashhurst. His mother said that his bowels had been opened several times daily. The pain was said to be paroxysmal, becoming very severe at times. On admission, at 9 P M, the temperature was 101.4° F, pulse 128, respirations 32 per minute. The abdomen was held very rigid throughout, but it seemed to be a voluntary rigidity, and there did not appear to be diffuse peritonitis. There was retention of urine, the dulness due to the distended bladder being evident on percussion in the hypogastric region. The urine was drawn twice by catheter, but subsequently was voided spontaneously.

The presence of appendicitis was excluded after the first examination, but no satisfactory diagnosis was made. Rectal examination was negative. It was decided to await the development of more certain symptoms before undertaking an exploratory operation. The bowels were opened only by enema. No purges were given at this time.

Not until the third day after admission was palpation of the abdomen entirely satisfactory. It was now possible to feel a mass in the left iliac fossa. This mass was firm and tender on

palpation and seemed attached to the iliac bone in the neighborhood of the left sacro-iliac synchondrosis. The mass extended nearly half way from Poupart's ligament to the umbilicus. It was dull on deep percussion and did not seem to be in close contact with the anterior abdominal wall. The rest of the abdomen was flaccid and there was no tenderness except on firm pressure over the tumor. The tumor could not be reached by the finger in the rectum and rectal examination was in no way painful. No polyp was detected. The question of diagnosis was still undetermined but lay between sarcoma of the sigmoid and an inflammatory mass which latter it was thought might have been caused by a previous attack of appendicitis. Psoas abscess was excluded on account of the absence of all bone lesions and because of the presence of early symptoms of intraperitoneal irritation. Iliac abscess of traumatic or tuberculous origin was also excluded for the latter reason.

The child was seen by various members of the staff both surgical and medical but no positive diagnosis was suggested. Purges and enemata were administered until the possibility of faecal impaction was absolutely excluded. The leucocyte count was 6,400 the day after admission. One week later 7,200.

Exploratory laparotomy was done on July 27 nine days after admission. An incision nearly three inches in length was made in the left rectus muscle above Poupart's ligament. There was much bleeding from the abdominal wall and the transversalis fascia and peritoneum were much thickened. On opening the peritoneum there escaped several drachms of clear serous fluid with no odor. Its appearance suggested the possibility of a rupture of the bladder with the extravasated urine encapsulated by adhesions. There were light inflammatory adhesions between the outer layer of the mesosigmoid and the parietal peritoneum. A gauze pack was introduced to exclude the small intestines from the field of operation and in doing this there was detected in the mesosigmoid a dense mass nodular stony hard in places. The sigmoid with its attached mesentery was then partially delivered through the wound the mesosigmoid turning on its attachment to the posterior abdominal wall like a door on its hinges. The tumor in the mesosigmoid was the size of a goose egg and several enlarged lymph nodes were seen on its surface just beneath the serous covering. The sigmoid itself was in no way



obstructed, but passed over the surface of the growth, and was normal to all appearances. No tubercles could be seen on the tumor, the sigmoid, the parietal peritoneum, or elsewhere in the field of operation. The tumor was of such cartilaginous hardness in places that it seemed impossible for it to be merely inflammatory in nature. It was thought to be a retroperitoneal sarcoma, and as its removal would have required resection of the sigmoid from the level of the iliac crest down into the true pelvis, all thought of radical operation was abandoned. One enlarged gland, close to the mesenteric border of the sigmoid, was removed from the surface of the tumor beneath the external layer of the mesosigmoid, the incision in the mesosigmoid was sutured, and the abdominal wound was closed in layers. The time of the operation was forty minutes. The convalescence was uneventful. The wound was dressed at the end of a week, the last sutures were removed three days later, and on the twelfth day the patient was allowed out of bed. He was discharged August 11, 1906. An examination of the blood, made August 1st, five days after the operation, showed that the leucocytes numbered 13,200, and that the hæmoglobin was 55 per cent. On the same day Dr C Y White reported that microscopical examination of the gland removed at operation showed marked inflammatory exudate throughout its structure. No evidence of tuberculosis could be detected.

The patient was seen again in the Dispensary three weeks after operation. The wound was firmly healed, but the tumor seemed to be nearer the median line of the abdomen, and was not apparently attached to the left iliac bone as before the operation. His bowels had been opened normally, without enema or purge, twice daily since leaving the hospital. The patient's mother was informed that an inoperable tumor had been found, and a gloomy prognosis was given.

On November 17, 1906, about three months and a half after the operation, Dr Ashhurst examined the patient at his home. He was playing around the streets, and had been in excellent health. His bowels opened normally, his appetite was good, and he never had any pain. Careful abdominal examination failed to reveal any evidences of the tumor. He had seen the child at intervals since then, and presented him to the Academy in perfect health, and without the slightest evidence of tumor.

Dr Ashhurst said that until within the past year very little surgical attention had been devoted to inflammatory lesions of the sigmoid and its mesocolon. During that time a large number of contributions have appeared and the pathology and nomenclature of these affections are becoming better understood. The literature of acquired intestinal diverticula up to 1904 has been admirably summarized by Dr Edwin Beer of New York and within the past year the diagnosis and treatment of inflammatory affections of the sigmoid have been discussed by Brewer, Lejars, Mayo, Monsarrat, Patel, Ries, Rosenheim, Sieur and others. The lesions reported by these authors may be classified as follows:

- 1 Sigmoiditis—*inflammatory hyperplasia of the walls of the sigmoid converting it into a rigid tube and usually causing a certain amount of obstruction.*

- 2 Perisigmoiditis—*suppuration usually localized due in most cases to perforation of a sigmoid diverticulum. Appendicitis is still recognized as a possible cause of perisigmoiditis.*

- 3 Mesosigmoiditis—*which in the patients reported by Ries was characterized by the presence of cicatricial bands in the mesosigmoid leading in one case to volvulus these bands being the result of previous more or less acute inflammatory changes.*

Most of the cases reported have belonged to one of the former classes, a majority probably being characterized by perisigmoid suppuration. It seems probable that in this case described by the term mesosigmoiditis the original lesion was a diverticulitis within the layers of the mesosigmoid. It is well known that diverticula occur in this situation as well as on the free border of the sigmoid and though their presence in any but adults is denied by many writers other authorities acknowledge the existence of congenital diverticula. In none of the reported cases however so far as he had been able to ascertain was the patient below the age of puberty and in none has there been such a marked tumor of the mesosigmoid with so little perisigmoiditis. Dr Deaver however had informed him that he had operated on a patient (an adult) in whom the patho-

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Perhaps the term *pseudo-sigmoiditis* might be employed to describe inflammatory lesion in the neighborhood of the sigmoid caused by primary disease of the appendix, ovary or Fallopian tube.

Patel in a paper published since the above was written refers to a case in a girl of 10 years reported by Walcha.

logical lesions considerably resembled those in the patient now reported, except that in Dr Deaver's patient the mass in the mesosigmoid was much softer, the sigmoid itself was quite strictured, and when the bowel was opened an ulcerated spot (not a diverticulum) was found at its mesenteric attachment

The treatment to be adopted depends very much on whether the condition is recognized as a purely inflammatory one, or whether, as in most of the earlier cases, it is considered malignant. In the latter case resection will be adopted for the operable cases, and the inoperable cases will be treated by either colostomy, enteroanastomosis, or exclusion if there is obstruction, or the abdomen will be closed, as in the present case, when no obstruction exists. If the presence of pus, or the history of early inflammatory symptoms, on which as a diagnostic point Lejars lays so much stress, make it seem probable that the condition is inflammatory, it will probably be best merely to drain the purulent focus and release such adhesions as obstruct the lumen of the sigmoid

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DR A C WOOD considers the pathology of these inflammatory lesions about the sigmoid more complex than might be supposed at first thought. They are not all secondary to diverticula, probably but a small minority are due to this cause. He has read of cases that were due to perforation of the sigmoid by foreign bodies, in one instance a pin had passed through the wall of the bowel, causing an abscess, and in another fragments of straw had in like manner perforated the bowel. Cases are reported in which the epiploic appendages were involved in these inflammatory swellings. Although the case reported by Dr Ashhurst is the youngest he has heard of, he believes it is generally admitted

that these diverticula may be either congenital or acquired and if congenital there is no reason why they may not cause trouble in early life. He does not consider the explanation that the diverticula result from constipation and distention of the bowel with protrusion of pouches of mucous membrane through the muscle fibres a satisfactory one.

Dr ASTLEY P. C. ASHHURST in closing said that in his case the diagnosis was of course largely conjectural. He thought however that the mass certainly was one of enlarged glands but he believes that if these glands had been simply tuberculous in character which he considers a rarer condition in the mesosigmoid than the presence of diverticulum there would have been symptoms of tuberculous disease and the course of the case would not have been so favorable. Although the condition is a rare one he sees no reason why this should not be considered a case of diverticulitis.

#### RADICAL CURE OF UMBILICAL HERNIA IN A CHILD WITH PRESERVATION OF THE NAVEL.

Dr ASHHURST reported the case of Thomas S. aged two and a half years who had suffered since infancy with an umbilical hernia which on admission was the size of an English walnut and was easily reducible. The ring admitted the little finger. There was also a right inguinal hernia.

Having seen the suggestion that the navel be preserved in operating on children especially boys for the radical cure of umbilical hernia he determined at the risk of being thought to do a complicated operation where a simple would suffice to attempt such an operation in this case. For the privilege of operating and of reporting the operation he was indebted to Dr Hodge in whose service at the Children's Hospital the patient was treated.

The operation was done July 25, 1907. A crescentic incision was made below and surrounding the navel down to the sheaths of the recti muscles. The flap of skin and subcutaneous fat thus outlined was dissected upwards for an inch or more above the navel the hernial sac being opened just beneath the umbilicus. The flap containing the navel was then turned upwards and the sheath of the rectus muscle on each side was opened transversely at the level of the ring. The sheaths with the intervening

linea alba were then dissected free from the underlying transversalis fascia and peritoneum. Then with three mattress sutures of chromic catgut the aponeurosis below the ring was drawn upwards into the slit between the transversalis fascia beneath and the sheath of the recti muscles superficially. The flap of aponeurosis on the thoracic side of the hernial ring was then sutured (with continuous stitches of chromic gut) to the sheaths of the recti muscles below, thus interposing, as in the usual overlapping operation, two layers of aponeurosis between the peritoneal cavity and the subcutaneous tissues. The skin flap was then sutured back in place, and a small catgut drain was introduced beneath it at one angle of the incision, because the absence of the hernia and the overlapping of the aponeurosis had made the skin flap somewhat redundant, and it was feared that some serum might collect beneath it were no drain employed. This drain was absorbed, having fulfilled its purpose, before the first dressing of the wound, when union was found firm throughout. The operation took only twenty minutes to do, and as the scar fades away in the natural creases of the abdomen it will be barely possible to tell that any operation has been done (Fig 1). The boy at least will not be an object of ridicule among his companions in bathing, etc.

The inguinal hernia was operated on at the same sitting. It was a hernia into a patulous processus vaginalis testis, and the Bassini operation was done. Both scars are now perfectly firm, and the boy is in excellent health.

DR JOHN H. JOPSON said that in 1906 he had seen Dr James Stone of Boston operate for umbilical hernia in a child at the Boston Children's Hospital, and Dr Stone advanced the same reasons for preserving the umbilicus that Dr Ashhurst had mentioned. He did not do as Dr Ashhurst described, but made a linear vertical incision. Dr Jopson repeated this operation on a child at the Presbyterian Hospital last winter. Referring to Dr Ashhurst's first case it seemed to Dr Jopson that the diagnosis of diverticulum was only a matter of conjecture, and that in the absence of an opportunity for resection and examination of the tumor and as there were undoubtedly enlarged glands in the mesentery it might just as well have been considered a case of enlarged glands in the mesosigmoid as the rare condition of diverticulitis.

F 6



Result of operation of umbilical with preservation of the



## LUDWIG'S ANGINA.

DR T. TURNER THOMAS read a paper with the above title for which see page 161.

DR G. G. DAVIS said that this was an intricate subject and one with many points needing elucidation. The pathology is intimately associated with the treatment. The disease is quite a fatal one; the mortality is still quite large. There seems to be no absolute accepted line of treatment. Dr. Thomas' paper points out a line of treatment. If the disease kills by interfering with the breathing, then the line of treatment should be to obviate as much as possible the edema of the glottis and the encroachment upon the air passages. If, however, infection is the lethal agent, then the treatment should be directed to that cause. Dr. Thomas spoke of 92 out of 106 cases beginning external to the mouth, and this brings up the cause of the infection beginning external to the mouth, probably in the submaxillary or retromaxillary region. It is very hard to see what should cause a primary infection of that region. Dr. Davis personally believes that the infection begins most often in the mouth and travels to the other tissues. He called attention to the statement made by Dr. Thomas that one author stated that the infection travelled to the lymphatic glands in the submaxillary region being conveyed by the lymphatics from the primary focus in the mouth. Dr. Davis does not believe it is a question of the lymphatic nodes. Inflammation of the submaxillary lymphatic nodes and of the retromaxillary lymphatics along the large vessels can as a rule be outlined by the sense of touch. The involvement of lymphatic nodes is usually more or less limited. This disease to Dr. Davis' mind pursues an entirely different course. Instead of producing discrete lymphatic enlargement we practically never see discrete inflammatory enlargement of the lymphatics. There is a wide spread board like inflammation in which all evidence of lymphatic nodes is obscured and there is no outline of any nodes. He believes the disease propagates itself by direct continuity of the cellular tissue.

It is hard to point out an absolute cause in all cases. In several cases which Dr. Davis has seen he believes the cause of the infection to have been in the teeth. He called attention to the specimen presented by Dr. Thomas showing the connection



between the mouth and the throat. It is obvious that if a person has an ulceration of the root of the teeth, and particularly if there is pus around a decayed tooth, it involves the submaxillary gland because this gland lies quite close to it, and if it simply follows the submaxillary gland down it goes right out of the mouth into the neck. It is extremely difficult to state definitely that the trouble originated submaxillarily and not intra-buccal.

As regards the character of the inflammation Dr. Davis believes it is generally admitted from a bacteriologic standpoint that several kinds of bacteria give rise to this disease, in other words, not only has the streptococcus been found in a large number of cases, but in several of the cases the disease has been found to contain, so to speak, only microorganisms which are of a single type, not streptococcal. For instance, pure pneumococcus cultures, and the staphylococcus, besides other bacteria have been found.

There is a question as to what extent is there sepsis and to what extent is there suffocation as relative lethal agents in this disease. There have been cases in which there was absolutely no indication of the slightest obstruction with respiration in which death ensued, which could only have been caused by infection.

Dr. Davis does not accept the temperature as a guide for septic infection. He stated that in some of the worst cases of diphtheria the temperature is low, while in other parts of the body, the appendix for instance, the infection can be very marked and the temperature can be low. One of the first things that strikes the physician in many of these cases of Ludwig's Angina is the depression of the patient. Some patients have the great swelling with no depression whatever, while others have a terrible amount of depression. Sometimes the pus is both free and offensive. Dr. Davis has seen two or three cases where the swelling has broken alongside the alveolus close to the bone. With regard to the making of incisions his favorite one is directly in the median line, as through this incision the finger can be put right through into the mouth, and the serum also drains freely into it.

He believes the disease is a local one, and that it often kills by infection, although a certain proportion of the cases are accompanied by respiratory symptoms. In these cases the larynx

is gradually choked off and then the patient goes around until something causes complete obstruction when naturally he dies. There are other cases which pass through a typical pyemic condition with chills, fevers, sweats, temperature 104 to 105, who die absolutely of sepsis without any respiratory difficulty whatever.

Dr Davis believes the line of treatment to be pursued is that which would direct against any local septic trouble. He considers free incisions perfectly justifiable in bad cases. In fact one reaching almost from below the ear posteriorly to near the symphysis anteriorly.

Dr W. JOSEPH HEARN called attention to the difficulty of etherizing patients suffering from Ludwig's Angina. In three cases which he had the opportunity of seeing there was great difficulty in this direction. In every case the patient was nearly suffocated. He was present at one operation where the surgeon had hardly got the patient half under ether when he was obliged to do a tracheotomy to keep the patient from suffocation. In one case of his own he attempted to give ether and the man became cyanosed. Dr Hearn therefore discarded the anesthetic and made free incisions as in ordinary cellulitis. This patient recovered. Dr Hearn presumes from the difficulty in administering ether that the pharynx and larynx must be involved.

Dr CHARLES F. NASSAU stated that his experience with this condition was limited to two cases although he also had the opportunity of observing a third that was under Dr DaCosta's care at the St. Joseph's Hospital. This patient died.

It is Dr Nassau's belief that the patients who get well are those in whom suppuration has been established. In one of his cases the condition followed during convalescence from scarlet fever. Cover slips were made and there was found to be a streptococcus infection. In both his cases the operation was done on account of the extremely rapid spread of the infection outwards and over the chest. In both the infections probably occurred through the tonsil as both patients complained of a tonsillitis a few days previous. In one of his cases this tonsillitis cleared up to some extent and then this infection began slightly at first occupying at least three or four days in its development. The patient did not have much fever nor pain but when seen by Dr Nassau she was in a good deal of pain. She took ether very well.

The other patient, not only on account of her extremely ill condition but particularly on account of the place where she was, was operated upon under cocaine anesthesia. This merely saved her the pain of the skin incision. In neither of his cases did he find any pus, the nearest approach to it was in the second case, where behind the sheath of the common carotid a few flakes of lymph were found, possibly the beginnings of suppuration.

Dr Nassau believes in the very widest and largest possible opening, even by the tearing up of tissues if this is found necessary. He believes that where the infection simply travels without suppuration the patient has a splendid opportunity of being carried off by the infection. He argues that sometimes one organism or one infection can be replaced by another, for instance, in an infection of the Fallopian tube which was probably of gonorrhoeal origin, there may be an acute flare-up, and at operation no gonorrhoeic organism found, it having been replaced by the streptococcus or some other organism of suppuration. In the same way there may be a peritonitis from, say, the colon bacillus, and at autopsy one may find only streptococcus as the fatal cause. Therefore one organism will kill another. This is the basis of what treatment Dr Nassau has given other than incision. His idea was to bring about suppuration as quickly as possible and to get the wound infected with something else. He does not consider it good treatment to keep these wounds too clean, but that a chance should be given for suppuration.

DR W M L COPLIN (by invitation) stated that he considered this subject of special interest to pathologists. For twelve years he has been directly interested in it. To call the condition cellulitis may be the truth but it is not the whole truth, it is really a myositis. It is peculiar in its distribution along the course of the muscles, and the change that takes place in the muscle fibres. If one will carefully examine these muscle fibres one will find that within the perimysium there is an extending exudate with the usual progressive myolysis occurring in various types of muscle inflammation, and an accumulation of numerous leucocytes within the muscle. He thinks one of the conspicuous features in cases of Ludwig's angina is the immunity of the lymph system. He has one specimen, a complete evisceration of the cervical region, in which the lymph nodes were examined microscopically, and showed practically no infiltration, one knows

of course that where an inflammatory condition involves the primitive lymphatics there is almost invariably a leucocytic invasion of the lymph nodes. In two of the cases in which Dr Coplin made complete sections of the neck he secured the glands and was amazed by the escape of the glands from this process. With regard to the submaxillary and the sublingual salivary glands he has a specimen from a case which has been reported in which these glands are bare and section shows that they practically escaped infiltration. The condition in one case in which it was impossible to make a complete dissection of the neck certainly began as a paramygdalitis. Sir Felix Semon refers to one or two cases beginning with what we would now call paramygdalitis. In this case the tonsil was almost completely dissected out by the extending necrosis but on section the organ is but slightly involved again illustrating the fact that the lymphatics may escape. With regard to the type of infection it is Dr Coplin's opinion that it is etiologically a polymicrobial process. It is not a disease that should be given a distinct pathological position because of its symptomatology largely determined by the peculiar anatomy of the neck it might be regarded as a clinical entity.

To return to the phenomenon observed in the muscle. The myochrome disappears early giving the muscles a washed meat appearance. Dr Coplin has seen muscles of the body of the tongue almost the color of the white meat of chicken. The muscle change resembles possibly superficially that peculiar disease known as the infectious myositis of Japan. The washed meat appearance is a very striking manifestation of infection travelling widespread through the muscle without focal necrosis. If one recalls the capillary injections of muscles in which a muscle fibre is seen festooned by the most elaborate capillary circulation like vines around a column one can understand that an infection gaining sufficient headway to sweep like fire through that kind of a circulatory field yields its toxin directly to the circulating blood hence must cause great depression even with a limited area of infection the systemic phenomena would be largely dependent upon the toxicogenesis of the invading organism.

Dr Coplin would look at the suggestion made by Dr Nassau that where suppuration occurs the patients would be better from just the other side. It seems to him that the explanation of these

cases is that the attack made by the antibodies is such as to secure a focusing of the infection and establish a necrosis in that area of limitation, that where the individual is unable to resist the infection it travels with such rapidity that we do not see a marked accumulation of leucocytes. That in these cases where suppuration does not occur there is just as much disintegration and destruction of the myochrome as in cases where suppuration does occur, but there is an immeasurably less abundance of leucocytes, and a less accumulation of antibodies.

Dr Coplin was greatly interested in the effect of the disease upon the organs of respiration. In one case which he had the opportunity to examine in very great detail, there was a clearly defined streptococcal bronchitis, while between the intralobular spaces one could see the lines of an interstitial pulmonary lymphangitis. Delicate yellowish lines traced over the incised surface of the organ and extended toward the pulmonary lymph nodes, and in this very case there was, in the peribronchial lymph nodes, no cellular infiltration.

In some of these cases there is a respiratory difficulty behind the respiratory obstruction of the larynx, just as we occasionally see in puerperal sepsis, in erysipelas, and in that peculiar disease, Brinton's disease, the absorption of toxic material and the induction of advanced suppurative interstitial pneumonia. Dr Coplin believes this is in some cases mistaken for capillary bronchitis, which presents a very similar clinical picture.

With regard to the atrium of the infecting organism Dr Coplin does not consider this of much importance, and believes that it has little material influence on the pathology of the lesion.

#### "COINCIDENT ABDOMINAL LESIONS"

Cases (I) *Appendicitis with ruptured extra-uterine pregnancy* (II) *Appendicitis, pregnancy and ureteral calculus* (III) *Dermoid cyst of ovary, pregnancy and gallstones* (IV) *Tuberculosis of ovary and appendix with floating kidney*

DR GEO ERETY SHOEMAKER said that the subject of combined operations or of operations for different lesions present at the same time, was one of interest and importance, frequently calling for the exercise of judgment. A number of years ago he read a paper before the Academy of Surgery advocating the removal of the appendix, if not normal, in all suitable cases when

the abdomen was opened for other purposes. The proposition was received with little respect at that time but in the evolution of surgical opinion has since become the practice of many good abdominal operators. When operating for other abdominal conditions examination of the appendix in all patients not in immediate danger from shock or exhaustion and where the fear of spreading septic material from another focus does not deter will result in demonstrating in at least 25 per cent of cases evidences of sub acute or chronic disorder of the appendix. In his last 400 abdominal operations not undertaken for appendicitis alone the appendix was removed in 88 or 22 per cent. Some of these disorders involve the organ only from without and can do harm chiefly by interference with drainage through angulation from contraction of the meso-appendix or of surrounding adhesions. Other cases show evidences of intrinsic disease of the appendix in various stages of development. This is particularly true of chronic pelvic inflammation with definite lesions of other viscera especially tubercular.

It may be difficult before operation to separate the appendiceal from the other inflammatory conditions present. Interesting papers have been presented on the topic of referred pain leading to obscurity in diagnosis between appendicitis and kidney or gall bladder disease chiefly. His object here was to draw renewed attention to the fact that even when one definite and important lesion is demonstrated and removed at operation the surgeon should not stop particularly in chronic cases until he determines that other organs are not involved. Dr Mayo has recently spoken of the systematic examination of the gall bladder from the lower incision. This of course can only be done when the incision is large enough to admit the hand and wrist and should be omitted when dealing with pelvic infections. It does not by any means follow that the second lesion should be operated upon at the same sitting. Indeed it might be a serious error to attempt to deal with a badly adherent and inflamed gall bladder the same day that an acute appendicitis required operation or vice versa. A bad hysterectomy may tax the patient's resources and the removal of an adherent appendix might bring the colon bacillus risk into an otherwise clean field. Quiescent inflammatory conditions of moderate severity in strong patients may however be attacked at the same sitting especially if in the

same general locality A movable kidney which is bad enough to cause trouble may be anchored at the same time that a chronic appendicitis is cured by appendectomy

In gynecological work it is constantly found that the same patient presents several conditions each of which causes trouble Hemorrhage requiring the curette, laceration of cervix and perineum requiring repair, bleeding and prolapsed hemorrhoids requiring operation, chronic salpingitis and appendicitis requiring conservative operation These may all be dealt with at the same sitting only if the inflammatory processes are quiescent If they are active the operations must be done in two groups, and the more serious should be done first He had a patient now convalescing in whom all of these conditions were operated upon at the same time

The patient must not be kept too long under ether and after the abdomen is opened, no work on another part should be done Minor procedures, such as repair of lacerations, should be carried out first, as these cause no definite strain, and the patient's danger begins only when the abdomen is opened Of course gloves and instruments are changed when the field is changed to the abdomen He reported the following instances of combined lesions of important type

I *Extra-uterine pregnancy associated with appendicitis*  
C, 41 years Not previously pregnant for 14 years Menses irregular and apt to be profuse for nine months No periods missed, but the last one, which began six weeks before examination, had been a week late, and bleeding had continued ever since The rupture of the left pregnant tube had occurred two weeks before with sharp pain followed by fainting and perspiration The ovum was still in the tube in a tiny unruptured sac of fluid Pregnancy was probably not over six weeks old There had been much rectal bleeding for several months, temperature had never been found by her physician to be over 100 when taken Symptoms had been so mixed including bleeding from bowel and vagina, severe pain in left abdomen chiefly and abdominal soreness and chronic indigestion, that attention had never been definitely fixed by her physician upon the appendix region and an attack of moderate severity had doubtless passed over before the ruptured extra-uterine pregnancy occurred

When referred to him in his office, the diagnosis of ruptured

extra uterine pregnancy was made and operation advised and performed the same day. The left tube was ruptured near the attachment of the broad ligament many ounces of free blood and clot found in the peritoneal cavity. Tube removed leaving corresponding ovary. Examination of the appendix showed a hard meso half an inch thick the appendix walls dusky red hard thick and rigid the mucous coat purple no pus removal. Diagnosis. Decided sub-acute appendicitis without perforation. Ruptured left pregnant fallopian tube and intra abdominal hemorrhage. It is interesting to note that in the four months which have elapsed since the operation the troublesome chronic indigestion present for years has disappeared.

II *Coincident acute appendicitis pregnancy and ureteral calculus with nephritis*. E. G. A patient is now in the Presbyterian Hospital where three prominent conditions had to be considered. First pregnancy at four and a half months with a very high right uterine cornu. Second severe pain with tenderness behind and about right kidney much blood in the urine abundant dark granular and other casts the pain passing down the course of the right ureter to right vulva. Third an acute right sided abdominal inflammation with temperature to 103° chills and a septic look. Leucocytosis 25,000.

This case was cleared up first by the passing on the day of admission of a sharp pointed crystal with the urine with relief of kidney pain second by laparotomy and removal of appendix the abdomen containing about two ounces of free turbid fluid no adhesions peritoneum deeply congested in right abdomen third by the use of large quantities of water by mouth and salt solution by rectum to overcome the nephritis. The pregnancy was undisturbed the child lives. The gauze drainage has now been removed and the wound is healed. The general condition good except for nephritis.

III *Coincident dermoid cyst of ovary pregnancy and gall stones*. J. C. 35 years old 6 children. Applies (a) because of severe pain in gall bladder region for one month through to shoulder. Constant distress also in epigastrium. No vomiting no jaundice no putty colored stools. Only similar attack followed a confinement two years before. Examination shows (a) a tender small gall bladder. (b) A rounded tumor four inches long adherent in pelvis with much soreness and pain about it.



(c) Pregnant two months Perineum and cervix much lacerated

As an adherent tumor overlying a pregnant uterus was a greater present menace than the sub-acutely inflamed gall bladder, the abdominal incision was made low down and a dermoid cyst of the left ovary four inches by three by two and a half firmly adherent was removed without rupture. It contained bone an inch long and cholesterin. The appendix was quiescent but showed old inflammatory changes. It was removed through the same incision. The gall bladder was examined through the lower incision and found to be tightly contracted around two large gall stones into an hour glass shape. There was no fluid. Operation on the gall bladder was postponed until after delivery, in the absence of dangerous symptoms. Recovery followed from the dermoid operation and appendectomy, the woman was delivered at term seven months later. She was seen a few days ago, and as she still complains of the gall bladder soreness she is to have an operation as soon as her child is old enough to wean.

IV *Tuberculosis of ovary and appendix Movable kidney*  
M E Single, 27 years. Attack called appendicitis four years before and a second two months before, ever since which walking and jarring hurt the right lower quadrant and up behind the kidney. Loss of weight 13 pounds, now 105. For two months an inflammatory swelling on 7th rib in front. Pain in right upper abdomen at times severe and apparently due to a very movable kidney which varies in size, now presenting a fusiform swelling which is movable and can be displaced upward as far as the umbilicus. The appendix is tender, the tubes and ovaries are fixed. The patient was bright, cheerful and intelligent, keenly desired relief. Urine normal.

To overcome the pain crises in the right kidney region, as the fusiform swelling was probably an early hydronephrosis, the kidney was anchored. The appendix was exposed through a gridiron incision. The peritoneum nearby was sparsely studded with small tubercles, no fluid, no adhesions. In the meso appendix a cheesy nodule size of grain of corn. Appendix sub-acute catarrhal inflammation, removed with cheesy meso stump buried. Through the gridiron incision the tubes were felt to be diseased. It was therefore closed and a small median incision made, through which by catgut ligation, the right tube was

resected and the left removed at the cornu. One third of the left ovary was removed. The tubes formed closed sacs imbedded in adhesions. No drainage.

Convalescence extremely smooth. Wounds healed primarily. Several days later under local anesthesia a tusiform yellowish flocculent mass of material looking like coagulated lymph was removed from the periosteum of the 7th rib leaving a smooth glistening cavity which promptly healed with packing. Pathological report of Dr. Steele. Tuberculosis of ovary, giant cells and typical areas of infiltration. Cells of larger type found in tubercles. No giant cells or caseation found in tubes.

These operations were done two years ago. Patient seen recently. Scars sound. No abdominal symptoms. Menstruation regular and painless. Walks well and works without distress. Kidney in place, no trouble since. No disease or tenderness in tubal or ovarian regions discoverable on examination of pelvis. Lungs negative. Weight same as before operation. 105. Considers that operations were of enormous benefit to her and claims to be gaining in general health though still slender and rather pale.

## BOOK REVIEWS

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DIE VERWUNDUNGEN DURCH DIE MODERNEN KRIEGSFEUER-  
WAFFEN, IHRE PROGNOSE UND THERAPIE IN FELDE By  
DR GRAF of Dusseldorf and DR HILDEBRANDT of Berlin.  
Volume II,  $8\frac{1}{4} \times 5\frac{1}{2}$ , pp 579, 180 illustrations Berlin,  
August Hirschwald, 1907

The second volume devoted to "Wounds Caused by Modern Firearms" by Drs Graf and Hildebrandt, has just appeared and is a valuable addition to medical knowledge, especially to military surgeons, since it is devoted primarily to diagnosis and treatment in the field

Instead of the general discussion of the subject found in the first volume of the work, this portion is devoted to the special consideration of wounds involving different portions of the body

The statistical research involved in the preparation of this volume must have been enormous, since the results of all the important wars between civilized nations since the Crimean War have been collected and utilized The Franco-Prussian War, the American Civil War, the Boer War in South Africa and last of all the valuable statistics relative to the Japanese-Russian War have all been drawn upon In this connection it is interesting to note that the percentages obtained in these various points relative to the parts of the body involved have not varied materially in a half century, and while there is a slight improvement in the mortality attending the treatment of wounded soldiers in the field during that time, the percentage of improvement is not so great as the advances in surgery would have led one to suppose

The wounds of the head, of the neck, of the face, of the spinal column, of the trunk and of the extremities are the headings of the five main divisions of the book, and each of these is sub-divided into sections devoted to such topics as may properly form chapter headings

At the beginning of each chapter statistics are given as to the relative frequency in the various wars of the injuries in-

volved and also tables of comparison showing the results obtained by treatment. These statistical tables while of little value so far as modern therapy is concerned add greatly to the value of the book as a volume of reference for military surgeons.

Diagnoses of bony injuries and of the exact location of missiles has been materially aided by the use of radiographs and a larger number of the illustrations used are derived from this source.

The effects produced by the different types of bullets used varying from the needle pointed bullet of the modern French rifle to the irregular and destructive missile caused by bursting shell and shrapnel have all contributed their share to the collection of wounds depicted and while it has pleased some writers to refer to the small caliber high power projectiles used in modern infantry rifles as merciful the fact remains that the mortality statistics remain high and do not vary materially from those of the time when soft leaden bullets were habitually used in warfare. Indeed as has been shown in our own city in the past few months the penetrating power of the modern weapon is so great that a woman stooping over to pick up some kindlings at a distance of over a mile from a rifle range was struck by a bullet which passed completely through one thigh completely through one arm and completely through the head causing six different openings in the body. In the olden time she would have been out of the danger zone in any event or if by chance she had been nearer the firing point such a number of wounds would have been improbable.

Among the many cases cited certain ones of course illustrate well the great variety of wounds which are received in an active campaign and the vagaries of a rifle ball in causing injury. In one case a bullet striking the right collar bone entered the supra clavicular fossa and remained within the body. The enormous exudate of blood in the right pleural cavity ultimately resulted in a septic thrombosis which so interfered with circulation in the body that the collateral circulation was ultimately established gave rise to an extraordinary development of the superficial veins of the legs and of the abdominal walls showing in the interesting photograph presented as large snake like vessels over the entire anterior surface of the body below the level of the diaphragm.

A rupture of the thoracic duct as an accompaniment of a wound of the lung, has been observed but once. It is little wonder that such an injury is a rarity, since the aorta lies so close to the duct. The projectile in this particular case, passed obliquely over the spot near the apex of the heart, backward to the right of the spinal column. It is probable that a contused area became necrotic, since the symptoms of injury to the thoracic duct and resulting chylo thorax did not develop for some days. A number of punctures permitted the accumulated chyle to escape.

Cure resulted probably because of collateral circulation permitting the chyle to find its way into the blood stream through a new channel. The torn portion was then probably obliterated.

In the paragraphs devoted to the methods of treatment in the field, of various forms of wounds, it would appear that in recent times the treatment by occlusion of the wound with sterile gauze applied at as early a date as possible, gave the best results save in those cases where the hæmorrhage from a wounded vessel was so great as to demand immediate operative interference. The results obtained in operative cases, particularly in penetrating wounds of the abdomen, unless, as rarely happens in the field, facilities are at hand for operation within six hours of the time of injury, gave but little encouragement to the surgeons, since the mortality rate remains practically as high in such cases as during the Civil War.

HENRY P. DE FORREST

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227-231 South Sixth Street,  
Philadelphia

# ANNALS OF SURGERY

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## ORIGINAL MEMOIRS

### TRACHEO BRONCHOSCOPY \*

WITH REPORT OF CASES

BY CHEVALIER JACKSON M D

OF PITTSBURGH PA.

UPPER bronchoscopy with the aid of the slide speculum is in most instances easy under general anæsthesia. The bronchoscope may be inserted at the first inspiratory movement not only without difficulty but without the slightest injury to the delicate mechanism of the larynx.

Under local anæsthesia upper bronchoscopy is in a few patients equally easy. In the majority of instances however the resistance and rigidity of the muscles is such that it is by no means easy fully to expose the laryngeal aperture for the insertion of the bronchoscope. In some of my work I have encountered old cicatricial larynges where the cartilages of the larynx and trachea had been destroyed by purulent inflammation and where the tissues surrounding the trachea and larynx were bound down and rigid with cicatricial tissue. In these cases especially as there is no inspiratory widening of the glottic chink it is very difficult to pass the bronchoscope under local anæsthesia by any of the methods heretofore in use. To overcome these difficulties I have added an extra handle to the slide speculum and a beveled end to the bronchoscope.

\* Read before the College of Physicians of Philadelphia Nov 20 1907

The handle affords a powerful leverage with which the base of the tongue and the tissues about the hyoid bone may be easily pulled forward out of the way and a good view of the larynx obtained under local anæsthesia. Endolaryngeal operative work may be done, and bronchoscopes may be passed by the aid of this instrument. One of its chief advantages is that no gag need be inserted until after the bronchoscope has passed the glottis. Gagging the mouth widely open hinders the drawing anteriorly of the tissues about the hyoid bone and the base of the tongue, by jamming the inferior maxilla down upon these structures.

To facilitate the passage of the tube in upper bronchoscopy I have been using recently a new bronchoscope, the distal end of which is cut off at an angle. The instrument otherwise is the same as those I have used for some years. The edge is thickened and rounded in the same manner to prevent injury to the mucosa. In use, the long end is directed forward toward the anterior commissure through which it can be passed with great ease. There is no need of waiting for an inspiratory movement, or for the subsidence of the glottic spasm. With this tube it is not necessary to expose the anterior commissure with the slide speculum as the point can be started between the posterior ends of the cords. There is no tendency for the tube mouth to catch over the arytenoids, instead of passing anteriorly to them. The slanting extremity has also the advantage that the point can be used in the bronchi as a retractor to draw aside spurs and orifices, thus greatly facilitating exploration.

*CASE I—Piece of wood in bronchus four days. Removed by lower bronchoscopy.* Aged 5 years, referred to me by Dr Adolph Lewin with the history of having aspirated the wooden plug out of a bamboo whistle four days before.

Dr Russel H. Boggs reported that he was certain the foreign body was present from a physical examination of the chest, but that it did not show radiographically because of the insufficient density of a small piece of wood. The child was so cyanotic when brought upon the operating table at the Western Pennsylvania

Hospital that a general anesthetic was out of the question. In fact the question of a preliminary tracheotomy arose in the author's mind and only his confidence in his preparedness instantly to stab the trachea induced an attempt at upper bronchoscopy. The head was held in the Boyce position by Dr J C Markle. Upon attempting to introduce a 7 mm bronchoscope which proved to be too large the breathing ceased. The tracheotomy was promptly done and the 5 mm bronchoscope was introduced. The bit of wood was found in the right bronchus and removed.

The tracheal wound was packed until it healed from the bottom. At the end of a week Dr H E Deers reported the wound healed and the child's condition perfect.

*Remarks*—This case points a very valuable lesson. When a foreign body case comes with dyspnea no attempt should be made even to examine the throat without making preparations for a tracheotomy. These preparations need be but a sharp knife and a hemostat for a dilator but these must be ready at hand for instant use separate from all other instruments. If a leisurely tracheotomy with careful hemostasis is preferred it certainly would be better to do the tracheotomy preliminarily under infiltration anesthesia.

*CASE II—Safety pin in trachea. Removed by upper tracheoscopy under local anesthesia.* Infant aged 12 months was brought to me at a public clinic in the Harper Hospital, Detroit, with a history of having swallowed a closed safety pin one month before. The stools had been carefully watched and the pin had not passed. There were no pulmonary symptoms whatever and the physical examination of the chest was negative. Under chloroform anesthesia I explored the esophagus and stomach thoroughly and finding no signs of the pin further examination was deferred until after Dr P M Hickey made two radiographs (Fig 1) which showed the pin in the trachea. With the assistance of Drs Hickey, Shurly and Minor I was able under local anesthesia to remove the pin (Fig 2) by upper tracheoscopy in a rather unusual way.

The larynx of an infant will not admit a 7 mm tube which was the smallest that I had with me in Detroit. I found however



that the mouth of this bronchoscope would enter the upper orifice of the larynx, fix the arytenoids and hold the glottis widely open. The view thus obtained is illustrated in Fig 3, which shows the cords at the sides, while posteriorly (dorsal decubitus) a large edematous swelling could be seen in the trachea below. The pin could not be seen, but I inserted a full-curved hook down into the trachea, and could feel the pin which I engaged in the hook so securely as to withdraw the pin from the trachea into and through the tube. The child made a complete recovery, without phonatory impairment. The radiograph is interesting as demonstrating that the pin was in the trachea. Had it been in the esophagus at the same level, it would have been in the lateral plane.

*CASE III — Tack in bronchus four days. Removed by upper bronchoscopy under local anesthesia.* Mary M., aged 12 years, came with a history that four days before she had choked on a mouthful of tacks, one of which "went down." She had had paroxysms of coughing with expectoration of pink frothy mucus streaked with blood.

Under local anesthesia, the 7 mm bronchoscope was introduced. The trachea and bronchi were found filled with pink frothy mucus in such large quantities that every landmark was hidden by it. The bronchoscope was removed and one with a drainage canal in its wall introduced and the aspirator started. Fully four ounces of mucus were pumped out during the examination.

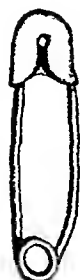
A beautifully clear view of the mucosa was obtained. It was seen to be reddened and swollen, and in three places excoriations were visible. The tack (Fig 4) was found point upward in the left inferior lobe bronchus and removed.

*Remarks —* The chief points of interest in this case are the enormous quantity of mucus present, the advantage of the aspiratory bronchoscope in such a case, and the location of the tack in the left inferior lobe bronchus. The excoriations would indicate that the tack for a time had been thrown about by the coughing. One of the excoriations in the right bronchus would seem to indicate that the tack had been temporarily in the right side.

Fr d 1h 1 2 3 4 5 6 7 8 9 10 11 12



FIG 2



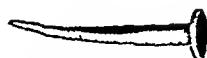
Pin removed from the trachea of an infant one year old

FIG 3



Endoscopic view down trachea, showing edema above the pin

FIG 4



Tack from left bronchus of girl twelve years old

CASE IV — *Pebble removed from the right bronchus by upper bronchoscopy* Martha M. aged 8 years referred to me by Dr Andrew Hunter of McKeesport. One week before while playing she had put a pebble into her mouth and started to run when the pebble stuck in her throat so that she could not get it up. A physician who was called prior to Dr Hunter had pushed the pebble downward as he supposed into the esophagus. The patient coughed violently for fifteen minutes expectorating some bloody mucus and she was hoarse for a time. Next day she was better but ever since had had violent paroxysms of coughing excited by motion. No dyspnoea except immediately after coughing no dysphagia no fever no pain until two days before when it appeared in the centre of the chest. Physical examination showed a sonorous rale heard occasionally all over both sides. There was nothing in the physical signs to aid in locating a foreign body. No dyspnoea.

The patient was radiographed by Dr George C Johnston and the pebble located in the right bronchus (Fig 5). She was admitted to the Eye and Ear Hospital and under chloroform I found by upper bronchoscopy with a 7 mm tube a large grayish mass wedged in the right bronchus the orifice of which was swollen and edematous above the mass. Forceps applied to the mass gave back a gritty sensation as the jaws slipped off. While working the respiratory current whistled through one of the lateral openings in the bronchoscope. Finally a very thin jawed forceps was introduced so that the flattened blades could be pushed well down on the pebble between the latter and the swollen mucosa. The foreign body was then withdrawn from its firmly fixed position. The tug of the forceps could be felt by the impulse transmitted to the bronchoscope to pull the bronchus and trachea upward so tightly was it imbedded in the bronchus.

It was too large to be withdrawn through the bronchoscope so the pebble tube and forceps were all withdrawn together. When the pebble arrived at the glottis it seemed too large to come through. It was stripped off from the grasp of the forceps and fell back into the trachea. The bronchoscope was again introduced when it was found that the smaller end of the pebble was in the orifice of the left bronchus into which however it was too large to entirely enter. The orifice of the right bronchus could be seen partially closed by swollen mucosa being dimin

ished to not more than half its normal diameter. The pebble was again seized and this time was pulled through the glottis in which it was such a tight fit that considerable force was required.

The child was discharged well, as soon as the effects of the chloroform had disappeared.

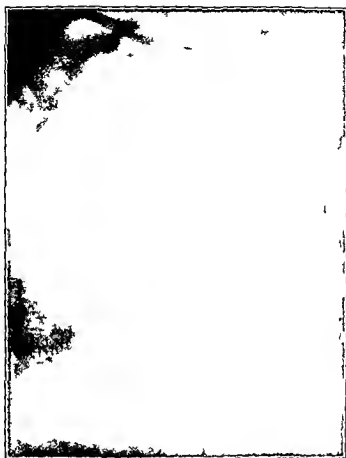
The pebble (Fig 6) measured  $7 \times 9 \times 17$  mm, was dark brown in color, of rounded outline, and of very smooth surface. In situ, its greatest dimension corresponded to the axis of the bronchus.

*Remarks*—This case illustrates one of the dangers of the crude old method of pushing down foreign bodies. The first attendant had felt the pebble with his finger but failing to get it up, he pushed it down, believing that it would pass safely through the gastro intestinal tract. Probably, it was in the glosso-epiglottic fossa. Certain it is that he pushed it through the glottis as if it were an intubation tube. Once through the glottis, the negative pressure of the violent inspiratory effort following the obstruction to breathing during the manipulation, produced a powerful negative pressure, which exerted upon so large, rounded, smooth and close-fitting a body, together with its density drove the pebble like a projectile into the right bronchus. In no other way is it possible to account for the tight impaction of the pebble in its position. Recent mucosal swelling would not do it, and the sojourn of the body was too short to permit of sufficient hyperplasia.

The size of the body indicated the elasticity of the bronchi. The diameter of the bronchi is changing every moment, but at the maximum normal dilatation the average diameter of the right main bronchus of children of seven years of age is 7 millimeters. Yet, here was a body whose cross section is  $7 \times 9$  millimeters which entered the bronchus for a distance of about 2 centimeters.

This case also illustrates the necessity of having the lateral openings in the bronchoscope. When the tube mouth entered the right bronchus, the latter being occluded by the pebble, the patient would have been getting no air and the work could not have proceeded had not the tube had lateral openings, one of

FIG 5



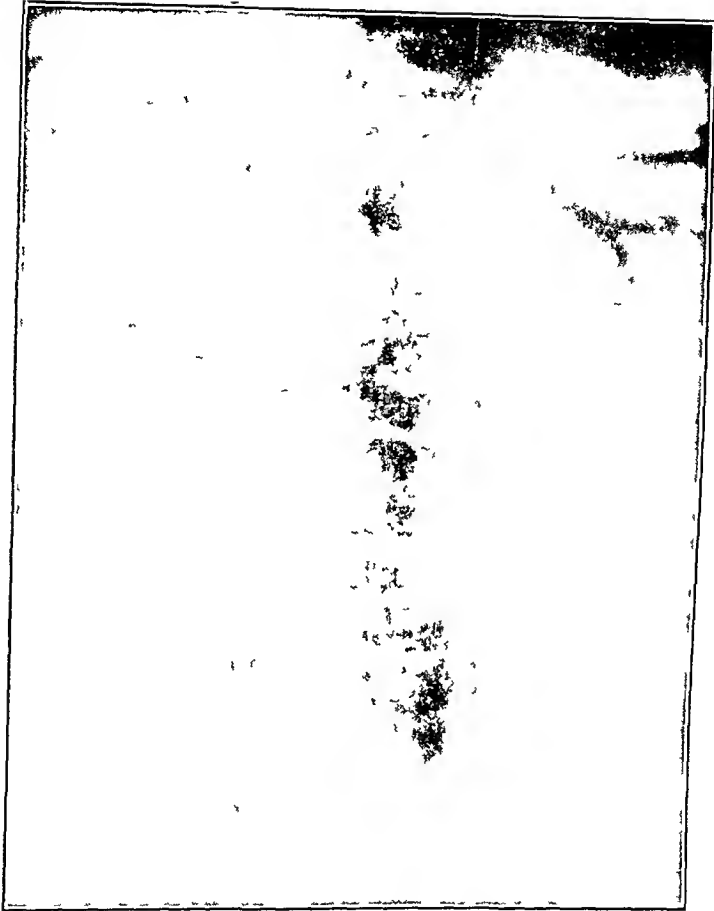
Rad g ph f p bbl l right b h f g l ighty l d

FIG 6



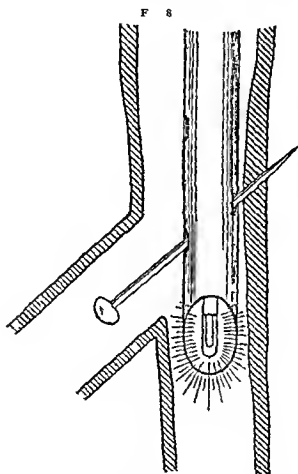
P bbl m ed f m right b h

FIG 7



CASE V —Radiograph, showing pin in right bronchus

which corresponded to the orifice of the right bronchus. Had it not exactly corresponded the result would have been the same as the bronchoscope used did not and should not fit tightly in the trachea so that there was abundant room for air to pass up the trachea until a lateral opening was reached.



Sch m illustrati g ecid t l Ca 1

**CASE V**—*Glass headed steel pin in right bronchus* Removed by upper bronchoscopy. Henry M. aged 4 was referred to me by Dr. A. D. Husted. The child had aspirated a pin five days previously followed by severe coughing attacks. A radiograph (Fig. 7) by Dr. George C. Johnston showed the pin to be in right bronchus head downward.

At the Eye and Ear Hospital the child was chloroformed by



Dr Edith Waldie, and with Dr L C Manchester holding the head in the Boyce position I removed the pin by upper bronchoscopy. A peculiar accident rendered the removal exceedingly difficult. I was using at the time a bronchoscope in which as I discovered afterward the holes were too near the lower end. When the bronchoscope entered the right bronchus the pin was seen, but just then the patient coughed and the bronchoscope was slightly withdrawn and cocain solution applied to the bronchial mucosa. The bronchoscope was again passed downward and when the opening of the upper lobe bronchus was reached a severe coughing effort forced the pin upward through the hole in one side of the bronchoscope and out through a hole in the other side, and into the bronchial wall, thus spiking the bronchoscope in position so that it could not be withdrawn (Fig 8). The pin could be plainly seen, across the lumen of the tube, but it could not be removed with forceps, nor could it be pushed downward. Pulling on the bronchoscope showed such rigid fixation that violent withdrawal was not to be thought of. After twenty minutes of fruitless efforts to dislodge the pin I resolved to break it, as the safest expedient. This was readily done by pushing downward on the pin while gripped in the forceps. The grip slipped slightly until the pin came against the canula of the forceps, when of course, any desired amount of thrust could be exerted, counter-pressure being exerted by the bronchoscope which I held rigidly against the upper teeth. The pin broke readily and two portions of it were withdrawn (Fig 9), but the third, the point probably about 5 mm in length was lost. Having previously broken my glasses my one eye had become temporarily useless from the mydriasis due to the cocaine coughed into it. Dr Waldie made a careful search and, finding nothing, I feel certain that the small point was lost in the secretions withdrawn with the tube. The child has been perfectly well ever since and has had no cough whatever.

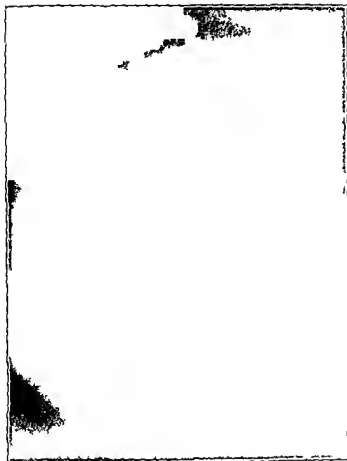
*Remarks*—This case demonstrates the necessity of having the lateral openings located at some little distance from the end. It also demonstrates the necessity of the wearing of glasses, to prevent coughing of cocain-laden secretions into the eye. Indeed, the necessity exists whether the secretions contain cocaine or not, for apart from infective risks, it is annoying and cer-

Fig. 9



CA V-P m d f m g h t b h l h d f u e a r s t g

Fig



Rad g ph h w g t k p l f t b b P w ed by b l p y throu h  
t l p ges

F



p i m d f m l f t b n h t b y b h o s p y



tainly interferes with good work to say the least to have the eye spattered with coughed out secretions. An unsterile nurse should be detailed to keep the glasses cleaned and this will be greatly facilitated if two pairs of glasses are at hand.

*CASE VI—Stick pin in the left bronchus. Removed by upper bronchoscopy.* Samuel B. aged 15 years brought to me by Dr M V Leof of Philadelphia at the suggestion of Dr E B Gleason.

About a week before he had choked on a scarf pin which escaped down his throat. This was followed by cough and brassy tasting expectoration. Cough had been very much less in the last two days. There was no pain in the chest. A radiograph by Dr Wilbird of Philadelphia showed the pin head downward in the left bronchus. An eminent surgeon who saw the patient advised against thoracotomy.

Dr Gleason who next saw the case gave a favorable prognosis and advised bringing the case to me. A radiograph (Fig 10) by Dr George C Johnston demonstrated the pin in the same position as before. Patient coughed every time he was asked to hold his breath for radiography. Physical examination by Dr John W Boyce revealed harsh breathing over left side scarcely amounting to rales. On forced breathing movement was greater on right side which unless discovered would have been misleading as to auscultatory findings. Resonance possibly a trifle better on right side but no great changes in percussion note.

At the Eye and Ear Hospital the boy was skilfully chloroformed by Dr W W Jones the head was held in the Boyce position by Dr John W Boyce and assisted by Dr Ellen J Patterson and Dr Edith Waldie. I removed the pin (Fig 11) by upper bronchoscopy. The task was a difficult one from the fact that the point of the pin had penetrated the right tracheal wall and was thus fixed at both ends. The violent coughing efforts excited by the presence of the foreign body had worked the pin downward by the ratchet like action of the pin itself. The head lay in the left inferior lobe bronchus at the orifice of the upper lobe bronchus. Traction on the pin with the forceps revealed the fact that the point was firmly fixed in the tracheal wall which

had been penetrated to a depth sufficient to cover the taper of the point, therefore, seven or more millimeters. Upon attempting to push the intruder downward I found that the limit of elasticity of the bronchus had been already reached by the ratchet-like action of the pin in working itself downward. Furthermore, violent coughing was set up by the pressure of the head of the pin upon the mucosal area where it lay, deep down in the left bronchus beyond the reach of safe cocainization. Only drenching the bronchus could have gotten cocain solution below the head. This I deemed unsafe. I finally succeeded in pushing the trachea to the right, off the point with the tip of the tube while making counter pressure with the forceps. After freeing the point, it was grasped in the forceps, when considerable traction was found to be necessary to dislodge the head, which was evidently buried in the swollen mucosa. The pin was pulled up until the head engaged against the tube, then pin, forceps and bronchoscope were brought up together. Considerable resistance was encountered as the head of the pin reached the glottis, but it was pulled through without the forceps losing their grip.

The boy left for his home in Philadelphia the same evening.

Neither morphin or codein was used in this case, and the cocain solution was of only 10 per cent strength.

*Remarks*—For reasons elsewhere mentioned I am not sure that the avoidance of morphin lessened the risk. A slight excitement after coming out of the influence of chloroform would seem to indicate the wisdom of the use of no stronger than a 10 per cent solution of cocain. Another point of interest is the large size of the intruder. Even allowing for its weight, it could not have simply dropped to the depth where found in the left bronchus. It must have been pushed downward into the bronchus, or more accurately, the bronchus must have been pushed up over the head in coughing, the point striking against a lower and still lower portion of the right tracheal wall, until the head came to a final stop owing to the narrowing below the giving off of the upper lobe bronchus. Then the heaving evidently forced the point of the pin into the right tracheal wall. This heaving I noticed with some misgivings, when working with the pin. No one who has not

witnessed it bronchoscopically can have any idea of the amount of spontaneous movement of the tracheo-bronchial tree. The bronchi diminish in size and move longitudinally to an incredible degree in coughing. In later cases I have found heroin hypodermically preliminary to anesthesia the best antitubercle.

Another valuable lesson to be learned from this case is the usefulness of the lip of the bronchoscope. I devised this lip originally to facilitate introduction of the tube mouth through the glottis without waiting for the inspiratory abductive excursion of the cords and without risk of abrasion of the laryngeal mucosa. Its usefulness as a spatula to press aside spurs and folds was demonstrated in previous cases but in this case its usefulness in extricating the buried point of a foreign body by pushing the tissues off the point was demonstrated. The tip cannot be seen when looking through the bronchoscope but the side on which it is is known by the position of the handle this being on the same side of the tube.

Including the cases herewith recorded the author has done 10 bronchoscopies for foreign bodies in the bronchi in which the foreign body was present. Of these the foreign body was removed in 7 not removed in 3. Eight were upper and 2 were lower bronchoscopies. Of tracheoscopies for foreign bodies the author has had 7 in which a foreign body was present. Of these 3 were dyspnoeic on admission and required tracheotomy and 2 not dyspnoeic and 2 dyspnoeic were upper tracheoscopies.

In all of the 7 the intruder was removed.

Recapitulating there were 17 tracheo-bronchoscopies for foreign bodies in the air passages below the larynx omitting cases in which a foreign body was absent. Of the 17 cases the intruder was removed in 14 not removed in 3. Not only was there no mortality but there was no reaction in any case.

# TRICHINOUS INFECTION OF A CARCINOMA OF THE LIP \*

BY EDMUND A BABLER, M D,

OF ST LOUIS, MO,

Associate Surgeon to the St Louis Skin and Cancer Hospital, Assistant in Surgery  
in the Medical Department of Washington University

The finding of trichinae in carcinomatous tissues is quite rare. In fact, a careful review of the available literature shows that only two such instances have been reported. In one<sup>1</sup> of these cases, the parasites were found in a carcinomatous lip, and in the other,<sup>2</sup> in a carcinomatous breast. In both instances the trichinae were found by the pathologist while examining the tissues for evidence of carcinoma. A private letter<sup>3</sup> from the Surgeon General's Library corroborates the assertion that the case herein reported is the second to be recorded in which trichinae were found in a carcinomatous lip. It is quite possible, however, that the association of trichiniasis and carcinoma is of not infrequent occurrence. Whether or not the presence of trichinae in the living tissues favors development of carcinoma, remains an open question.

The case herein reported is of interest not only because of the finding of trichinae in the carcinomatous lip, but also in demonstrating the danger of permitting apparently harmless warts to grow. In the future we will publish a report of eighteen cases of malignant disease treated at the St Louis Skin and Cancer Hospital in which the primary growth was a wart or a mole.

CASE—Mr G S, white, laborer aged 62, was admitted to the surgical service of the St Louis Skin and Cancer Hospital, October 14, 1907, and gave the following history

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\* From the St Louis Skin and Cancer Hospital, Service of Dr F J Lutz

<sup>1</sup> Stewart, Modern Medicine, 1899, Vol 8, p 53

<sup>2</sup> Timm, Virchow's Archives, 1864, Vol 30, p 447

<sup>3</sup> Courtesy of Dr Fletcher of the Surgeon General's Library



D. Babl cas f tri h ca i m f th l 1 p



FIG 2



Micrograph of section showing trichinae (1a) among the tissue of a carcinoma of the lip

*Family history*—No history of malignancy or tuberculosis in family

*Previous history*—Usual diseases of childhood. Smokes and chews tobacco. smokes more or less constantly. drinks moderately. About twenty five years ago he noted a small wart on his lower lip near the middle but since it caused him no inconvenience he gave it but passing notice. About a month or two ago he noticed that the wart was rapidly becoming larger and that his lower lip was swollen. Pain has been slight but the dribbling of saliva caused great discomfort. Denies lues. Has not lost flesh of late although he eats at irregular hours and poorly cooked food. Of late the warty like growth has been more or less constantly covered with a scale or scab.

*Present trouble*—Comes to hospital on account of the increasing size of the warty like growth on lower lip and the swelling of the latter.

Examination shows patient well nourished and in apparent good health except for the growth on and swollen condition of his lower lip (Fig 1). The entire lower lip is swollen. near the centre of the free margin of the lip is a scaly growth presenting the characteristics of an epithelioma. The swollen condition of the lip does *not appear to be due to the epitheliomatous growth only*. The submental and the submaxillary glands are not palpably enlarged.

Having been so frequently impressed with the fact that a wart may suddenly show malignant changes and appreciating the importance of early excision the patient was admitted to have the growth removed. One day later the entire lower lip was excised and the submental glands removed. The silkworm gut sutures were removed on the fifth day. Union was primary. The pathologic report follows.

*Pathologic Report*—Laboratory No 959—The epithelium covering the surface of the specimen suddenly changes from the normal to an irregular layer of great thickness. In this portion, long finger like projections of cells extend deep into the underlying tissues. Throughout the greater part of the growth the cell nests have penetrated down into the muscular tissues and have brought about an atrophy of the muscle fibres. Along the advancing periphery of the new growth there is a very marked infiltration of lymphocytes and plasma cells. The cells found in the nests are quite large and polygonal and contain a large round or oval vesicular nucleus. Many of them show varying

degrees of keratin formation, and typical epithelial pearls are very numerous. The cells on the surface of the growth show marked keratin formation and parakeratosis. On the mucous side of the specimen is found a small salivary gland. On the skin side are seen numerous hair follicles, sebaceous and sweat glands. Lying deeper within the muscular tissues are two bodies, circular in shape (see Fig 2) with a surrounding rim of homogenous substance that stains with eosin. This ring encloses cells and nuclei enclosed within a definite membrane. In between these bodies is a small amount of a granular pink staining material. External to the capsule is a slight amount of round cell infiltration. These masses lie embodied in the muscular tissue, and the adjacent muscle fibres have been flattened in varying degrees. The appearance is that of an encapsulated trichina. These bodies lie quite close to quite a large artery.

Before concluding I want to thank Dr Lutz for permission of reporting the case, Dr Guthrie McConnell for the pathologic report, and Dr Mook for the photograph.

# LUDWIG'S ANGINA

AN ANATOMICAL CLINICAL AND STATISTICAL STUDY

BY T. TURNER THOMAS, M.D.

OF PHILADELPHIA

Assistant Surgeon, University of Pennsylvania  
Philadelphia General Hospital

(Part II Continued from page 183)

A cellulitis localized to the submaxillary region regardless of the kind of infection in the writer's opinion is not a Ludwig's Angina but becomes one as soon as the process invades the floor of the mouth and the pharynx. Poulsen as we have seen assumed that the invasion occurred through the pharyngeal wall. Delorme merely located the phlegmon in the sublingual tissues without attempting to trace its further progress while Semon simply stated that extension occurred from the throat to the neck or from the neck to the throat without reference to the path of progress. Davis seems to agree with Semon but adds that it spreads along the connective tissue by direct continuity.

The writer hopes to demonstrate how a cellulitis about the submaxillary salivary gland may progress along planes of connective tissue to the mouth and pharynx and why such extension so quickly invades the region of the larynx. Leterrier said that not enough attention had been paid to the anatomy of the mouth in connection with Ludwig's Angina, and he is the only author so far as the writer can learn who has paid any attention to it. He drew his conclusions from a study of the topographical anatomy of Tillau and the demonstrations of Sebileau. The writer has made a special study of this subject by dissections of this region.

The anatomical work was done in the department of Applied Anatomy of the University of Pennsylvania and the

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Read before the Philadelphia Academy of Surgery November 4

writer wishes, here, to thank Professor Gwilym G Davis, the department head, for his kindness in furnishing all the necessary facilities To Professor Geo. A Piersol the writer is indebted for the freedom of his anatomical department and his specimens, and to Mr Erwin F. Faber for valuable assistance in emphasizing in the illustrations those points which are essential to an understanding of the text This opportunity is taken to acknowledge also the writer's indebtedness to Professor J William White for kindly criticism and valuable suggestions

Few portions of the body are so imperfectly dissected by the average student as is this region As a result few physicians can comprehend with any detail the anatomical relations of the floor of the mouth in its relation to the pharynx and larynx Special sections were necessary to expose the tongue, the pharynx and the larynx, and the adjacent parts of the neck in the same specimen. By a transverse section of the head above the upper surface of the tongue, and a vertical section through the pharynx, of the lower part removed by the transverse section (see figure I), a part of the head was obtained which gave a free exposure of the tongue from above and of the posterior part of the tongue, the anterior wall of the pharynx, and the complete larynx The parts involved in Ludwig's Angina were thus preserved in this portion of the head and could be dissected from above and below The facts brought out by these dissections taken in conjunction with the clinical facts repeatedly demonstrated by the recorded cases and with the autopsy reports, seem to clear up many of the obscure points associated with this condition Only those autopsies which have shown the condition of the larynx have been considered.

*Anatomy.*—The muscular floor of the mouth is formed by the two mylohyoid muscles which fuse with each other at the anterior median raphe This muscular diaphragm separating the mouth from the neck is a complete one from the posterior edge of one mylohyoid muscle to that of the other and is a comparatively strong one There are no openings

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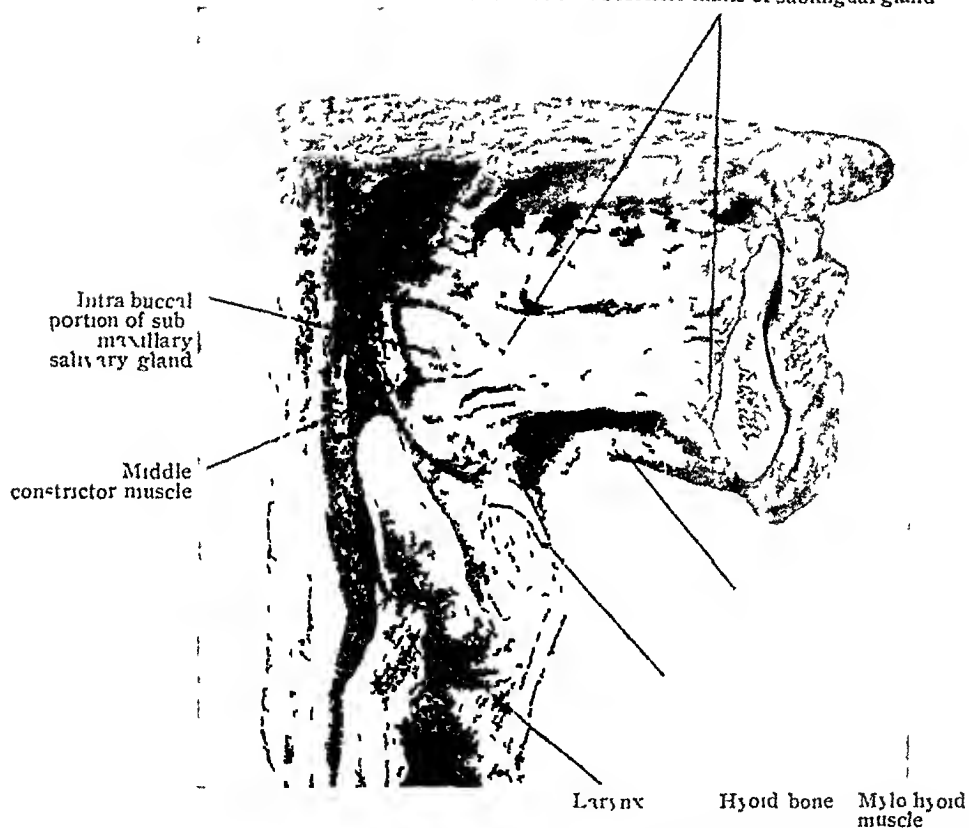
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FIG 2

Anterior and posterior limits of sublingual gland



Half of specimen opposite to that illustrated in Fig 1. Half of tongue removed, to show continuity of cellular tissue about the submaxillary and sublingual salivary glands, and proximity of deep portion of submaxillary gland to larynx.

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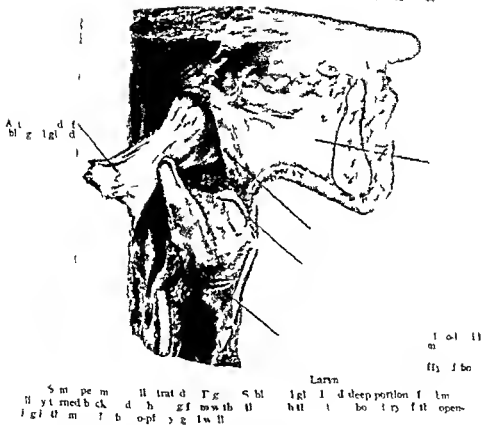
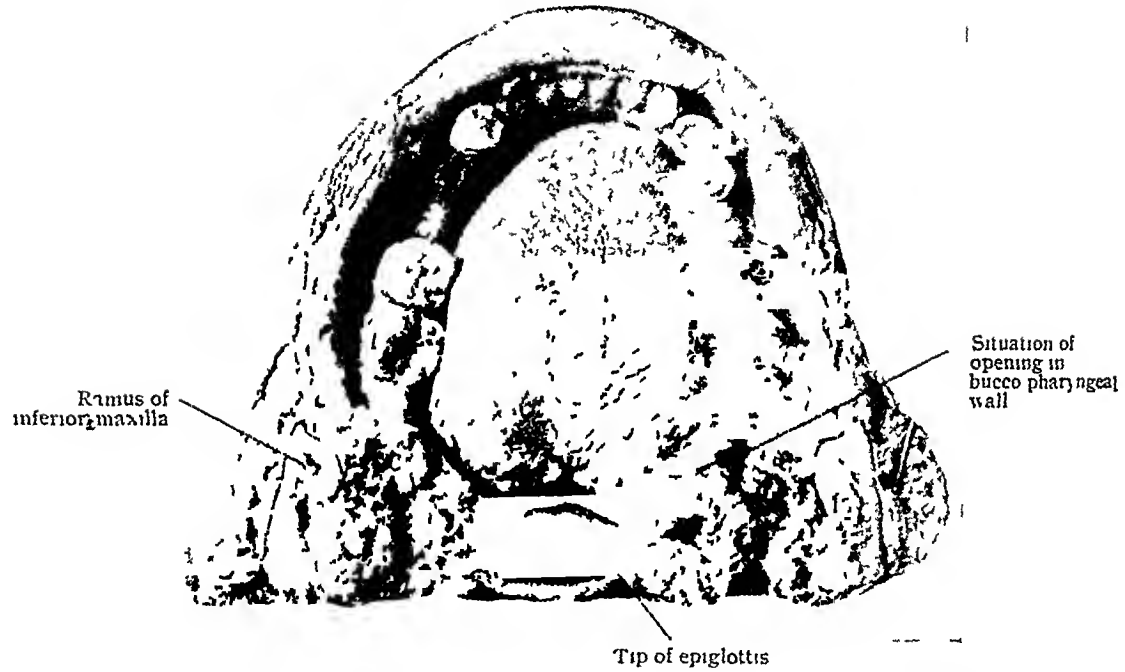




FIG 4



Upper surface of specimen similar to that formed by the union of the two, illustrated in Figs 1, 2 and 3. Tongue crowds teeth laterally. It is loosely attached and has dropped backwards, slightly.

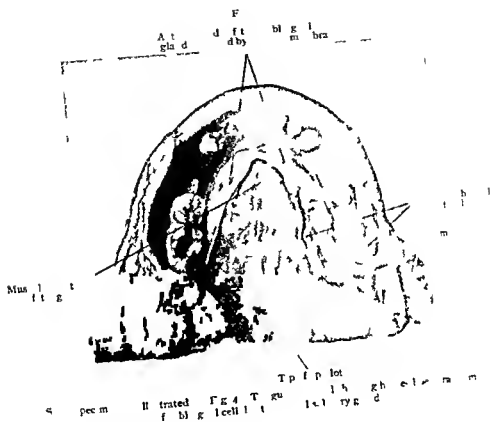
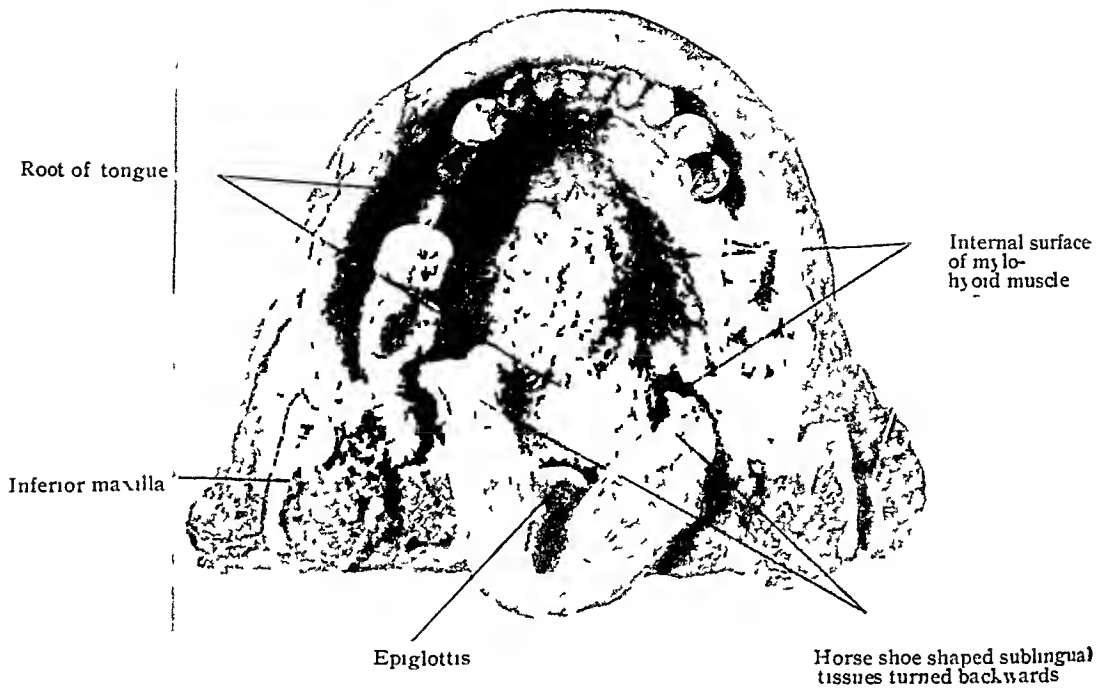


FIG 6



Same specimen as illustrated in Figs 4 and 5 Horse-shoe shaped sublingual tissues turned backwards showing their continuity with similar tissue in the submaxillary region through the bucco pharyngeal opening The alveololingual sulci are also shown

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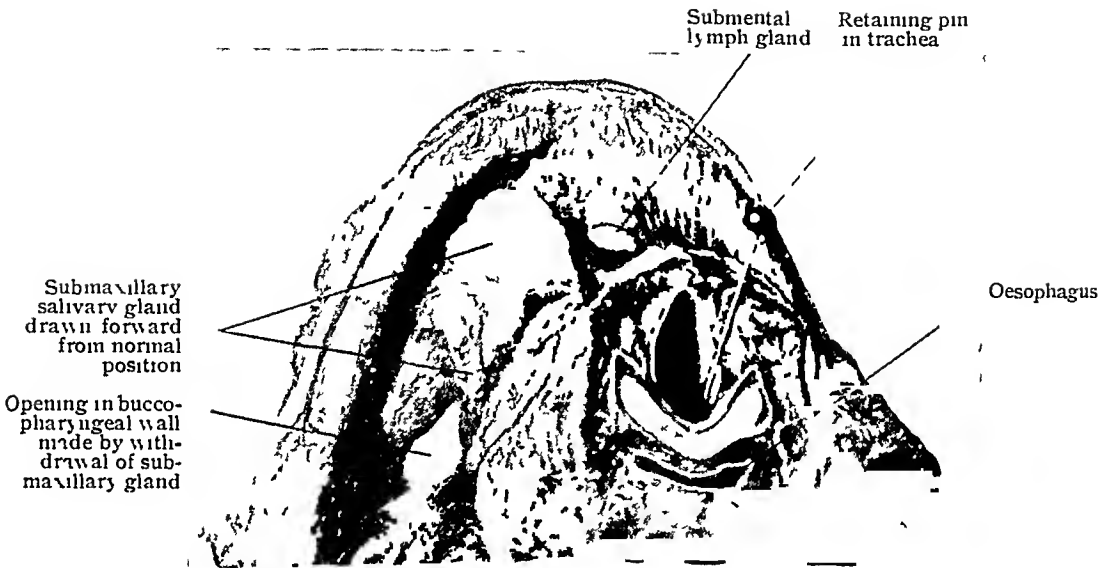
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FIG 8



Same specimen as illustrated in Figs 4, 5, 6 and 7 Same view as in Fig 7 The submaxillary salivary gland being drawn forward the bucco pharyngeal opening is well shown The fissures between the mylo hyoid and middle constrictor muscles, however, extends from the hyoid bone to the angle of the jaw

in it for the passage of planes of connective tissue between the mouth and neck. From the posterior border of the mylohyoid on each side extend backward the constrictor muscles of the pharynx separating the pharynx from the neck the muscles of the two sides fusing together at the posterior median raphe. The three constrictors superior middle and inferior overlap each other so that here also the submucous tissue of the pharynx is not continuous with the connective tissue of the neck through these muscles. Between the posterior edge of the mylohyoid and the anterior border of the middle constrictor however is a considerable deficiency in the bucco-pharyngeal muscular wall (see figure 8). This opening extends from the hyoid bone upward and backward to the inner side of the lower jaw near its angle. The hyoglossus muscle which viewed externally forms a part of the floor of the submaxillary triangle does not enter into the formation of the floor of the mouth or pharyngeal wall. It passes upward through this muscular opening or gap to become a part of the root of the tongue and fills the gap considerably. Those structures which pass from the neck into the mouth or in the opposite direction do so through this opening. These are the glossopharyngeal and hypoglossal nerves the lingual artery and vein and the styloglossus muscle. The greater part of the opening however is occupied by the deeper portion of the submaxillary salivary gland which here projects into the floor of the mouth near the root of the tongue where it lies just under the mucous membrane. The gland may therefore be said to form a small part of the floor of the mouth. The submaxillary gland within the mouth is adjacent to the posterior part of the sublingual gland and is attached to it by the surrounding loose connective tissue (see figure 2). We thus see that the connective tissue in the submaxillary fossa is directly continuous with that in the floor of the mouth so that the extension of a submaxillary cellulitis to the sublingual region which occurs so early and so constantly in Ludwig's Angina is readily understood. The observations of Huguet

and DeBovis, who, while regarding Ludwig's Angina as a sublingual phlegmon, said that this "can only be the result of diffusion of an inflammation developed more posteriorly in the region of the parotid or angle of the jaw," is seen to have a sound anatomical basis. What is more important, it supports the statements of Ludwig and the great majority of writers reporting these cases, who said that it began in the region of the submaxillary gland. The difficulty in explaining why this extension occurs so rapidly in some cases is not so great as in explaining why such extension does not occur in more cases. Probably it does occur much more frequently than we have suspected and is overlooked because its nature has not been understood. It has probably been arrested many times by prompt incision before alarming symptoms have had time to develop. While walking through one of the wards of a hospital recently, the writer's attention was arrested by a case of extensive submaxillary cellulitis. The mouth could not be opened and when the patient was asked if he experienced any trouble inside the mouth he said that beginning with the day before he had considerable difficulty and pain in swallowing. An incision had been made that day. On the following day he reported that he felt much better and that the dysphagia had disappeared. The inflammation had probably begun to extend into the mouth in this case, and had been arrested by the incision. Of Poulsen's 251 submaxillary abscesses, as already stated, in 22 the swelling involved the floor of the mouth, and in 2 (not the 2 reported by Poulsen as examples of Ludwig's Angina) this swelling was so abundant that an incision in the mouth was necessary. As a rule the inflammation subsided after incision in the submaxillary region. Poulsen regarded only 3 of the 22 as examples of Ludwig's Angina, and paid little or no attention to the rest, so that we can obtain light on the progress of the other cases, only by inference from the associated facts. Of the 251, 11 or 4 per cent, died. Poulsen says that the great majority were cases of simple or localized adenitis. A death from simple or localized adenitis must

be exceedingly rare so that almost all of the 11 deaths in all probability occurred among the 22 in which the floor of the mouth was invaded since as the writer will show this must always be a very dangerous condition. If this were true of all the 11 deaths the mortality among the 22 cases would then be 50 per cent which is approximately that of Ludwig's Angina as determined by other writers. In the writer's collected cases the mortality was 40 per cent. In the anatomical specimens it was observed that the connective tissue about the gland in the opening in the muscular floor of the mouth was small in quantity. The gland being somewhat wedge shaped with its base external and its apex internal it is possible that a massive exudate external to the gland might force it more snugly into the opening as a plug thus aiding in localizing the inflammatory process to the external tissues more effectively in some cases than in others. It was generally the fulminating infections which were present in Ludwig's Angina in all probability because of the great facility with which they extend along planes of connective tissue.

A phlegmonous cellulitis in the floor of the mouth as from an infected wound is a menace to the life of the patient regardless of the kind of microorganism producing it. Relief must be afforded promptly or the process extending the larynx will soon be invaded and the patient suffocated. To appreciate the reason for this a further study of the anatomy of the floor of the mouth is necessary.

The mouth with the jaws closed may be roughly compared to a small box of which one side has been removed. The upper side or roof is represented by the roof of the mouth the lower side or floor by the two mylohyoid muscles the front and lateral sides by the teeth and jaws. The posterior side is absent. With the jaws closed the mouth is practically filled by the tongue and the normal sublingual tissue. Therefore when the cellular tissue under the tongue is invaded by inflammation as in Ludwig's Angina the tongue is pushed upward and the mouth must open to make room for the new inflammatory material. Speech and



deglutition are necessarily interfered with and the saliva now increased by the inflammation can not be properly swallowed and frequently escapes from the mouth. The tongue crowded for room may show between the teeth and appear to be swollen when it is not. It was actually swollen, in one of Parker's cases, from invasion by the inflammatory process (see page 343). The tip, at least, is probably rarely involved. Posteriorly the tongue becomes wider and dips downward and backward toward the larynx, where the base of the epiglottis is attached to its posterior surface. Laterally the base of the tongue reaches the side of the pharynx, where it receives the attachments of the styloglossus and palatoglossus muscles. These attachments of the sides of the tongue to the walls of the pharynx, make on each side a strong muscular ridge covered by mucous membrane and submucous tissue, the latter being scanty here. This prominent ridge separates the floor of the mouth from the pharynx, so that a submaxillary infection extending through the opening already described, and finding itself in the floor of the mouth in front of this ridge, must extend through it along the intermuscular fascia or over it along the scanty submucous tissue. This explains why the swelling in the floor of the mouth is so well developed before the oedema has produced alarming symptoms in the pharynx and larynx. The finger placed in the mouth will easily find this ridge. Since the tongue turns downward and backward, the sublingual swelling lies in front of this posterior portion, so that the tongue with the epiglottis attached to its dorsum is pushed backward toward or against the posterior wall of the pharynx, tending to obstruct the air which is passing from the nose and mouth to the lungs. By the same mechanism in anaesthesia, the dropping backward of the tongue and epiglottis may interfere with respiration.

It is probably little appreciated how limited is the space confined within the arch of the lower jaw. It will suffice here to point out that the distance in a straight line from the symphysis along the floor of the mouth to the base of the

epiglottis and therefore to the upper orifice of the pharynx is approximately only  $2\frac{1}{2}$  inches (see fig 1) The submaxillary salivary gland lying in the opening in the floor of the mouth is about on a transverse plane with the base of the tongue i.e. just anterior to the larynx so that the portion of the gland projecting into the mouth is only about 2 inches external and anterior to the larynx. The chief protection of the larynx at first is the muscular ridge already described.

A further brief description of the floor of the mouth will be of value in explaining some of the points which have attracted the attention of various writers. For instance it has been frequently reported that the hard sublingual swelling was of a horse shoe shape. The floor is divided into two lateral portions (see figure 6) by the muscles which pass upward from the symphysis of the lower jaw and the hyoid bone to the tongue the hyoglossus and geniohyoglossus. The geniohyoid aids in forming the lower portion of this median septum (see fig 1). The two lateral alveololingual sulci thus formed are freely continuous with each other anteriorly under the fraenum of the tongue but are terminated abruptly posteriorly by the lateral attachments of the base of the tongue. They are thus seen to have a horse shoe shape and as they are filled by the sublingual and portions of the submaxillary glands surrounded by loose cellular tissue the swelling due to cellulitis in them will assume a horse shoe shape also. It has been observed in a few cases that a submaxillary cellulitis of one side with extension to the floor of the mouth has been followed in a short time by a corresponding but smaller swelling on the opposite side the two not being continuous under the chin. Some of these cases are probably to be explained by extension of a submaxillary cellulitis of one side to the floor of the mouth along the sublingual sulci and out through the opening in the floor of the mouth on the opposite side. More frequently bilateral swelling results from extension along the external connective tissue under the symphysis.

What has made Ludwig's Angina so important is the

frightful rapidity and certainty with which an unchecked case proceeds to a fatal termination. The submaxillary region is already intensely swollen, so that the jaw can not move downward to relieve the crowding of the mouth and pharynx. The sublingual pressure can not find relief in that direction, even if the mylohyoid muscle did not resist its downward progress. Above it meets the resistance of an overhanging probably rigid tongue, which is already pressed against the roof of the mouth. Extension anteriorly or laterally is resisted by bone and teeth. The direction of least resistance is backward, in fact it is the only direction in which the rapidly accumulating new material can force its way. When we take into consideration the fact that it enters the mouth not far from the larynx and that while the inflammation is invading the floor of the mouth it is also more slowly passing backward toward the larynx, we can better appreciate why the dyspnoea follows so soon after the swelling of the floor of the mouth.

Only prompt relief of a pus collection by incision or a spontaneous opening can be expected to give relief, and these have failed in some cases. It is true that spontaneous resolution has occurred in some cases, but this can not be depended on. Leterrier doubted if it ever occurred and believed that in those cases in which it was reported to have taken place, an unobserved spontaneous opening had developed. In the writer's 106 cases there were 17 in which a spontaneous opening was reported, and in every one there was an internal opening. In only one was an external opening associated. While he would not deny the possibility of spontaneous resolution, the writer would consider it very likely that in some cases in which it was reported to have occurred, a spontaneous opening had been overlooked. It could be so situated under the tongue that it could not be exposed on account of the difficulty in opening the mouth. Only the escape of pus would announce its presence, and this is frequently so small in quantity or so gradual that it could easily escape unrecognized in the abundant and often turbid saliva.

The spontaneous opening is usually internal probably because pus developed about the submaxillary gland finds itself nearer the mucous surface than the skin of the neck. The inflammatory material inside the jaw and under the tongue is probably under greater pressure than that external to the gland in the neck which is always abundant so that the inflammatory area should break down more quickly where the pressure is greatest and therefore the blood supply most compromised.

Of the writer's cases the following reported by Parker illustrates clinically better than any of the others the mode of origin and path of progress of the cellulitis in a Ludwig's Angina.

JOHN K. aged 12½ years was admitted to the hospital Sunday September 8 1878 at about 10 P.M. On the preceding Thursday (before which time he had been quite well) a small lump appeared below the jaw on the left side. It increased in size until Saturday and then appeared to be an ordinary abscess of the neck. On Sunday it remained much the same until 4 P.M. Then the patient began to complain of his tongue which was swelling. By 6 P.M. his tongue had reached about quadruple its normal size and it protruded from his mouth. On admission to the hospital at about 10 P.M. there was considerable swelling below the jaw on the left side and to a less extent on the right side. No fluctuation but great oedema. Tongue much swollen red and tense and protruding between the teeth preventing closure of the mouth which is open to its full extent. Escape of much saliva. On the following day breathing more uneasy. Incision in neck at most likely place but no pus reached. Toward evening on account of great distress the tongue was freely incised on each side of the median line with considerable relief in a short time. September 11th the condition had somewhat subsided. On raising the tip of the tongue pus can be seen issuing at a point where the mucous membrane is reflected from the tongue to the floor of the mouth and a probe can be passed downward and backward for three or four inches. September 14th neck again incised and pus found. Convalescence soon followed.

This is probably as clear a clinical demonstration as one could find of the origin in a lymph gland, with periglandular extension to the cellular tissue, first in the submaxillary region, then to the floor of the mouth and tongue, and finally to the region of the larynx as shown by the increasing difficulty in breathing. The occurrence of the spontaneous opening under the tongue with a subsidence of symptoms, probably, had much to do with the recovery of the patient. It was the only one to be found among the writer's cases, in which the mouth was reported to be opened widely and the only one in which the tongue was markedly invaded. The opened mouth is probably to be explained by the fact that the floor of the mouth and the tongue were invaded before the submaxillary swelling had become too massive to prevent depression of the lower jaw, which in this case was demanded early for the accommodation of the early swelling in the mouth.

The writer's study of his cases does not show that the pathological changes occurring in the infected area differ materially from those which may be expected from any severe pyogenic infection occurring under similar anatomical conditions. Of the 106, spontaneous resolution was reported in 8. In 26 no pus was found. Two of these showed putrid foci. In 66 pus was found. In 12 of these the pus was described as putrid, and in 5 gas was associated. In three gas without pus was reported, and in 3 more the process was spoken of as gangrenous. While this classification is, probably, more or less inaccurate—the pus might have been putrid and the fact not have been mentioned, and gangrene might have been present and the fact have been overlooked—it will demonstrate that, in all probability, the pathological changes present were the result of ordinary severe infections, as the streptococcic or staphylococcic. The bacteriological examinations which have been made in these cases, would then be seen to have agreed with the other pathological findings. The proximity to the alimentary tract will account for the frequency of gas and

putrescence while the intensity of the inflammatory process and the compression of the inflammatory swelling inside the jaw and under the tongue with the massive hard tense swelling externally will explain the tendency to gangrene. It is probably no more frequent here than when such an infection occurs under the dense palmar fascia.

The question as to the advisability of retaining or rejecting the name Ludwig's Angina is one that probably will not be easily decided. While the process is pathologically identical whether it begins in the throat, in the mouth or in the neck, from the standpoint of prognosis and treatment as already stated, a sharp distinction should be made between those beginning in the throat and those beginning in the neck. From the same standpoint those beginning with a cellulitis in the mouth by direct extension from the primary focus in the mouth (there were 8 of this type among the writer's cases) might be included with those originating in the submaxillary region. If the primary focus in these cases is exposed before the development of the submaxillary swelling prevents opening of the mouth, it can be thoroughly disinfected and the process probably arrested early. We might speak of these two varieties as sublingual phlegmons, one being primary, the other secondary. But this would disregard the submaxillary cellulitis which in the great majority of cases would be the primary condition and then the most important because it is the one to be attacked surgically. We might speak of this class as cases of submaxillary cellulitis with extension to the mouth and throat. Ludwig's Angina would be more convenient and would be sufficient since this is exactly the condition which Ludwig described. Delorme, who regarded it as essentially a primary sublingual phlegmon, argued for the retention of the name Ludwig's Angina. The writer believes that the time has not yet arrived when we can conveniently discard it.

*Clinical Course*—While the etiology and pathology of this condition has not been established, the clinical picture as given by Ludwig has probably never been questioned.

He recognized the fact that various grades of severity may be met with, but presented the clinical course of the severest type, in order to emphasize the symptoms more forcibly, and to facilitate the diagnosis. From his study of the subject, the writer has been led to the conclusion that Ludwig's picture, while it may accurately describe the average case of his time, will not answer so well for that of the present. That is to say, the gangrenous or putrefactive conditions are not met with so frequently nor do they reach the advanced stage when present, which seems to have been the rule in his day. This change is due, probably to the fact that expectant treatment is now much less frequently employed. The progress of the infection is arrested earlier by more prompt incision and drainage. The irregular septic temperature, profuse sweats, delirium and progressively profound typhoid state, are by no means so common now. With few exceptions modern surgical treatment will arrest the progress of the infection or the patient will die in less than 10 to 12 days. Since his clinical picture appears to be the standard, and from time to time is given in more or less detail in journal articles, the writer wishes to present it here in order that he may apply to it briefly his own interpretation of the symptoms.

"The condition is ushered in with the usual symptoms of a rheumatic or erysipelatous angina, *i e*, slight fever, repeated chills, headache, coated tongue, etc., sometimes with slight difficulty in swallowing. At the same time there develops a unilateral or bilateral hard swelling usually of the cellular tissue surrounding the submaxillary gland, sometimes of that about the sublingual or parotid. Extension of the process occurs in all directions along the cellular tissue, toward the chin and the opposite side, and toward the larynx and the parotid, forming a considerable swelling. The intermuscular tissue and even the muscles become involved. The sublingual tissues form a hard, congested swelling, arranged like a cushion just inside the inferior maxillary bone, and the tongue is pushed upward and backward. The mouth

is opened with pain and difficulty. Movements of the jaw swallowing and speaking are considerably disturbed. The skin is movable during this local stage (4 to 6 days) the general condition is little disturbed and the fever moderate. Soon the skin becomes reddened the sublingual swelling softens and at times shows crepitation. Occasionally fluctuation appears to be present as though pus were there. But this is not the case. Soon an opening occurs in the floor of the mouth discharging a thin grayish or reddish brown offensive fluid which more and more assumes in character the discharge of a putrefactive process. The constitutional symptoms now become more severe: the fever is higher sleep is disturbed profuse sweats and delirium appear and the typhoid condition becomes more profound. Deglutition remains difficult although the swelling becomes less tense and suggests improvement. Dyspnoea sets in and increases and probably indicates an affection of the nervous system rather than a mechanical obstruction of the respiratory tract. Perhaps this is due to effusion into the chest. The symptoms develop with alarming rapidity and are characteristic of a putrefactive typhoid process. Death from coma and lung paralysis occurs in 10 to 12 days from the commencement of the disease.

The following points he considers to be diagnostic

1 The insignificant inflammation of the throat which often disappears entirely after the first few days and which if it persists may be looked upon as superficial

2 The wood like hardness of the swelling which does not pit on pressure

3 The hard sublingual swelling forming a ring just within the lower jaw reddish or bluish in color

4 The sharp limitation of the indurated tissues which are surrounded by uninvolved healthy connective tissue. The slight involvement or more often lack of involvement of the glands although the inflammation attacks the connective tissue around the gland

The writer believes that there will be nothing obscure



in this clinical picture, if we take into account the anatomical facts to which he has already called attention, and the known facts concerning the usual rapidly spreading infections of the connective tissue. It is assumed that we are dealing with a case in which the infectious germs have gained entrance through some focus in the mouth and the first signs of cellulitis have appeared in the submaxillary region, where Ludwig located them. In the ordinary case of infection arising in this way, the germs pass by the lymphatic vessels to the glands, causing no trouble in the vessels. As soon as they reach the gland they begin to produce inflammatory changes and being confined the inflammatory material produces pain. If the infection is mild or moderate, it will probably remain limited within the capsule of the gland long enough to permit a localizing barrier of lymph to be prepared. In this way is developed the ordinary localized lymphadenitis which is so common in this region. Occasionally such a localized swelling will take on rapid growth and become diffuse, *i e*, the infection breaks through the barrier of lymph and spreads quickly along the cellular tissue. A localized osteo-myelitis, for example in the tibia, may break through the periosteum and set up an overlying cellulitis so rapidly as to confuse the diagnosis with that of erysipelas. Much more rarely than in the localizing cases and most characteristically in streptococcic infections, the process extends from the gland to the cellular tissue so rapidly that its glandular origin is overlooked. The fever, chills, headache and early difficulty in swallowing may be accounted for by this inflammation, or it might be due to the preliminary angina present in some cases. The characteristic extensive swelling of the neck is due to extension along its cellular tissue. The superficial fascia offers no hindrance to it in any direction, while the connective tissue in the submaxillary fossa is abundant and lax and freely continuous with the same tissue in the retromaxillary and submental regions. In Ludwig's description and in almost all the reported cases the sublingual swelling and elevation of the tongue are referred to after the submaxillary

swelling has been mentioned which is to be explained by extension through the opening in the floor of the mouth already described. The submaxillary swelling is hard so that its extension should be hard also. The skin is at first movable and not inflamed because the process begins deeply in the lymph gland and invades the adjacent connective tissue with great thickening or swelling of the latter before it reaches the skin which is inflamed later. The invasion of the floor of the mouth by the inflammation and its extension to the pharynx and larynx in the writer's opinion will satisfactorily explain the troublesome dysphagia and the dyspnoea. Its early invasion of the larynx and in some cases of the lungs will explain the rapidity and certainty with which an unchecked case goes on to a fatal termination.

The following description of Ludwig's Angina taken from Poulsen is that given by Boehler more than twenty years ago and was based upon a study of 35 cases. It is repeated here because of its brevity and simplicity because it will be of value for comparison with Ludwig's more detailed account of the clinical course and because as the writer views it it is nothing more than the description of a submaxillary lymphadenitis with periglandular extension along the connective tissue due to a virulent probably pyogenic infection.

Under febrile and slight disturbances in swallowing there develops in an otherwise healthy person in the region of the submaxillary gland of one or both sides an indurated in the beginning indolent somewhat movable tumor which appears to proceed from the connective tissue around the submaxillary salivary gland. The overlying skin is natural and movable. The swelling which is at first the size of a hen's egg extends more and more over the side of the neck reaching as far down as the sternum. There is an infiltration of the connective tissue which surrounds the muscles of the neck and extends to the alveololingual sulcus the soft palate and the pharynx. The tongue from the great swelling in the floor of mouth is elevated and pushed to the

opposite side Generally as the process extends farther, the skin of the submaxillary region becomes oedematous and dark red Perforation occurs in the oral cavity, and in the submaxillary region with the escape of brown fetid pus The breathing becomes laborious, and the patient dies in a state of septic intoxication "

*Autopsies*—Of the writer's 104 collected cases, autopsies were reported in connection with 25 In only 16 of these is there a description, direct or indirect, of the condition of the larynx Those in which such reference was found are briefly reviewed here Thirteen showed positive laryngeal involvement, two were negative, and in one (Zillner), the writer would infer from the vague reference to the involvement of the mucous membrane, that oedema of the glottis was present Of Cartonli's case it was said that the larynx, trachea, pharynx and oesophagus were not damaged This patient on the day of his death had symptoms of pneumonia with orthopnoea, so that it is more than probable that death resulted from respiratory failure The blackish condition of the subcutaneous tissue with ichorous pus oozing from its cut surfaces, was said to have extended into the tissues above the hyoid bone and under the jaw and as far as the posterior surface of the pharynx, destroying the surrounding tissues This would have brought it so close to the larynx that the question naturally arises as to whether the condition of the pharynx and larynx was determined from their outer surfaces through an external incision, or whether the internal surface was exposed freely and the mucous membrane directly inspected Of Macaigne and Vanvert's case it was said that the larynx was sound and that the aryo-epiglottic folds were not oedematous Yet in this case dyspnoea developed on the second day, about 24 hours after the onset of the condition, and the patient died a few hours later, although his general condition did not seem to be very grave In the writer's judgment, the clinical side of the case points strongly towards oedema of the glottis Death could hardly have been due to septic intoxication If oedema of the glottis

were present in these two cases or if these were excluded from this group the strongest kind of a case would be made out for invasion of the respiratory tract more especially of the larynx as the essential cause of death in the typical Ludwig's Angina.

**CASE I—HEIN**—Man 32 years military officer robust constitution Admitted to the hospital Aug 15 1823 for an indurated submaxillary swelling of the left side which had begun some days before in the region of the submaxillary gland Movements of tongue limited and painful Deglutition disturbed from beginning Could swallow only liquids In the bucco pharyngeal cavity no redness nor inflammation Respiration normal Later swelling reached clavicle Increased difficulty in respiration. At end of some days softening in lowest part. Incisions here give fetid purulent liquid No relief to patient Death from asphyxia Aug 8th the 13th day of the stay in the hospital

*Autopsy*—Some fibres of gangrenous cellular tissue in abscess Surrounding tissues form a putrid mass which communicates at the level of the angle of the jaw with pharynx Complete mortification of muscles above and below hyoid bone and muscles of larynx nearly completely destroyed Mucous membrane of larynx and trachea dark colored, like gangrene. Ventricles of Morgagni contained thickened grayish black mucosites Other organs normal

**CASE II—HEYFELDER**—Female 37 years pale cachectic and gouty for 7 years Towards end of August, 1837 exposed to repeated chills which were followed on Aug 30 by moderate fever heat lumbago and acute pain in right side of neck. Aug 31 swelling in region of right submaxillary gland was the size of a goose's egg Movements of head disturbed. Deglutition painful Tonsils swollen but not inflamed Isthmus of fauces red Sept. 1 swelling much greater and of woody hardness Mouth opens with acute suffering Tongue projects posteriorly Speech and deglutition difficult but not painful Examination of posterior part of mouth impossible Tumor under tongue Very considerable prostration Sept 3 everything much worse and patient very weak Cannot expectorate abundant mucus which collects in mouth Jaws separate only a few lines Deglutition nearly impossible *Delirium* Sept. 5 suppuration and crepitation on palpation. Deglutition and opening of mouth better but general condition worse Puncture at a soft spot with escape of abundant fetid pus Sept 6 median incision from chin to hyoid with escape of fetid pus gas and gangrenous debris Sept 8 coma. Sept. 9 death

*Autopsy*—Affected region a dark foul mass Salivary glands pale bluish at periphery normal in their depth Cervical portions of vagus and recurrent nerves were a dirty red Muscles had lost their relations in consequence of the gangrene of the cellular tissue which surrounded them

Mucous membrane of tongue, pharynx and nose, slightly inflamed and covered with grayish mucus Tonsils healthy Mucosa of larynx and trachea presented a livid appearance and was covered with foul adherent mucus Small abscesses were disseminated in the inferior lobes of both lungs Heart soft and flabby Turbid fluid in pericardium Liver, spleen and right kidney softened

CASE III—BERMAN—Female, 18 years, habitual good health Com-  
plained of bad second left molar on Aug 26, 1838 Aug 27, on same side,  
appeared a hard, parotid swelling Alveolo-dental periostitis, opposite the  
caries tooth Aug 28, abscess opened itself on external side of diseased  
tooth and discharged a mass of fetid pus External swelling does not  
diminish, and it is extremely hard Sublingual swelling forms a hard  
ring around the tongue, which is pushed up against the roof of the  
mouth Voice harsh and muffled Considerable dyspnœa Aug 29, spon-  
taneous opening under the tongue with escape of fetid pus mixed with  
blood External inflammation progresses to opposite angle of jaw and  
to sternum Deglutition and respiration very troublesome Aug 30,  
bad night Delirium Considerable dyspnœa Swelling invades greater  
part of thorax Aug 31, prostration increases Extreme dyspnœa Deglu-  
tition impossible Sept 14, stupor develops, finally coma and death

*Autopsy*—36 hours after death Complete mortification of muscles  
from chin to sternum Impossible to recognize their structure Volumi-  
nous cellular debris and a considerable mass of fetid pus

Epiglottis destroyed Mucous membrane of larynx and trachea  
swollen and covered by viscid mucus Mucous membrane of pharynx and  
œsophagus is blackish in color On internal surface of inferior maxilla  
is a fistula, communicating with the gangrenous focus

CASE IV—ZILLNER—M B, 30 years, insane for 3 years As the  
result of a cold there developed a hard non-painful swelling of the left  
cheek About seventh day, chills, agitation and delirium Ninth day,  
spontaneous opening in the mouth near angle of jaw, discharging abun-  
dant sanious pus Swelling continued to spread anteriorly and toward  
the clavicle Thirteenth day, second spontaneous opening externally  
below angle of jaw Fourteenth day, death

*Autopsy*—Crepitation on pressure over the whole swollen region  
Overlying skin bluish red Subcutaneous tissue granular, while hard and  
resistant In the suprahyoid region, below the floor of the mouth, all the  
organs, mucous membrane, cellular tissue and muscles are transformed  
into an extremely putrid mass Periosteum destroyed and inferior maxilla  
denuded, in the greater part of its extent In the place of the sub-  
maxillary and sublingual glands there is a large cavity filled with pus, its  
walls being made up of connective tissue The sheath of the sterno-  
mastoid is filled with pus

CASE V—FINGER—Woman, 29 years, presented a Ludwig's Angina,  
on the twelfth day of a typhus fever In the morning the sublingual  
gland and the surrounding cellular tissue were much swollen Tongue  
considerably infiltrated and pushed against the roof of the mouth by the  
prominent swelling in the floor Respiration much disturbed, causing

fear of an œdema of the glottis Patient died in the evening presenting all the symptoms of suffocation.

*Autopsy*—Cellular tissue around the submaxillary and sublingual glands on both sides of the neck infiltrated with a yellowish purulent serum and much swollen Muscles of the velum palati mucous membrane of the pharynx and larynx and all the corresponding half of the tongue are much swollen and infiltrated with a pale purulent serous fluid The infiltration descends as low as the sternum

CASE VI—DOIG.—R 2 years soldier Has had swelling of the neck for some days When admitted Feb 4 1876 he had a painful swelling extending over the whole of the left side of the neck Parotid submaxillary and sublingual glands of the same side much swollen and very painful On the right side the submaxillary gland is equally indurated but is not of the same size as on the left side Floor of mouth elevated and tongue pushed upward Hypersalivary secretion Considerable disturbance of deglutition Intense dyspnœa Insomnia Paroxysmal anxiety Skin over swelling normal except that it is a little œdematous near angle of jaw Puncture here no pus Death by asphyxia Feb 8th

*Autopsy*—43 hours after death All the left side of the neck from inferior maxilla to clavicle is a semiliquid extremely fetid mass All the tissues of this region glands muscles and cellular tissue are nearly completely destroyed The portion of the jaw adjacent to the destroyed submaxillary gland is denuded of its periosteum In the buccal cavity one finds the mucosa epiglottis and vocal cords swollen red and covered with mucus There are ulcers of the tonsils

CASE VII—CARTONLI.—Man 50 years Admitted to hospital on evening of October 4th 1879 Hard right submaxillary swelling Speaks and opens his mouth with difficulty It was learned from his companions that on the evening before he was feeling well and that the swelling had not been there for more than two days Oct 5th temperature in morning and evening was 39.5 Trismus present Deglutition impossible Esophageal sound introduced into stomach to relieve dysphagia but did not meet with any obstacle Abundant salivation Lungs congested Oct 6th temperature 39.5 Delirious during night During day appeared symptoms of pneumonia with orthopnœa Tongue protrudes between teeth Death during night

*Autopsy*—Left lung hepatized Right submaxillary region hard and œdematous Skin cyanosed Subcutaneous tissue blackish Small quantity of ichorous pus oozed from cut surfaces This condition of the tissues extended more or less into the tissues above the hyoid bone and under the lower jaw The submaxillary gland is hypertrophied sclerosed grayish and on section gives issue to an ichorous material The ichorous infiltration extended deeply internally and below to the posterior surface of the pharynx destroying the surrounding tissues Larynx trachea, pharynx and esophagus not damaged

CASE VIII—BAKER.—J A. 25 years Admitted to hospital Feb 6 1862 When first seen he was suffering from swelled neck and great

difficulty in breathing" Great swelling on left side of neck and smaller swelling on right side, extending toward median line Skin dark purple, very brawny and here and there is boggy Higher up under the chin is an indistinct sense of fluctuation Mouth open Tongue against the roof of the mouth, and of normal size, and consistency Mucous membrane of floor of mouth elevated to level of free edges of lower teeth Fauces cannot be seen Dyspnœa began night before admission, when he could not breathe without being propped up in bed Soon after admission, he was found not to be breathing Immediate tracheotomy Pulse stopped

*Autopsy*—Seropurulent, necrotic infiltration of cellular tissue and muscles On opening trachea, the rima glottidis is found nearly closed, with effusion of semipurulent matter into submucous tissue This extended to the epiglottis Glandulæ concatenatæ, submaxillary and parotid glands, much enlarged

CASE IX—BICKERSTETH—Man, 40 years On admission, speech very difficult and indistinct Breathing embarrassed Great swelling beneath jaw Floor of mouth raised and tongue pushed upward and backward against roof of mouth Examination of fauces impossible Surgeon notified and came immediately, but patient died a few minutes before he arrived at the hospital Patient had been seized with rigors and severe pain in submaxillary region three days before admission Shortly afterwards, there was swelling from the lower jaw to the sternum Skin was normal in consistency, color, and mobility, but was tense

*Autopsy*—Shortly after death, a puncture with a tenotomy knife was made in the floor of the mouth, when a small quantity of air and some sero-samous fluid escaped All the connective tissue around the trachea and between the muscles is infiltrated with a seropurulent fluid, extending upward to the root of the tongue and downward into the anterior mediastinum The submucous cellular tissue is similarly affected, producing anteriorly, sublingual tension, and posteriorly, œdema glottidis and general œdematous laryngitis

CASE X—MICHEL—Man, 38 years Admitted to hospital, Dec 2d, and died same day Vigorous health Duration of disease, four days Suprahyoid, median and lateral swelling as high as ear, more marked on right side No fluctuation Constriction of jaws Swelling of buccal floor Marked dysphagia Dyspnœa marked also, but no threatening of suffocation Abundant foul saliva Speech embarrassed Temperature at 4 P.M. 39 Origin in carious tooth, causing a submaxillary swelling, which rapidly increased At 6 P.M. median suprahyoid incision, only blood escaping Patient seemed slightly relieved, but at 11 P.M. he died suddenly of suffocation

*Autopsy*—24 hours after death Only the larynx and adjacent organs removed Cellular tissue gangrenous only on right side Coffee-cup-full of phlegmonous pus in right retromaxillary region, where the lymph glands are very large Submaxillary and sublingual glands congested and slightly indurated Pharyngeal mucosa red and slightly thickened in its retrolaryngeal portion Tonsils slightly enlarged with

some points of intraglandular suppuration. In cutting through the anterior wall of the pharynx there is seen a whitish soft tremulous edema of the supraglottic portion of the larynx. The aryteno epiglottic folds the superior vocal cords and the epiglottis are double their normal size. The uvula is hypertrophied and edematous.

**CASE XI—GIBSON**—Man 49 years. Came to out patient department with swelling of neck below lower jaw which began at noon of the previous day when there was observed a scab on the right side of the neck below the jaw. At that time the swelling was enormous extending to the chest and as high as the zygoma. Is a heavy drinker and had been drunk the evening before the trouble began. Perceptible enlargement of the salivary glands. No lymphatic glands could be felt. Skin normal in color. No pain on firm palpation at any part of the swelling. Floor of mouth considerably thickened but tongue was not swollen or raised to any perceptible extent. Slight dyspnoea. Just beneath the jaw on the right side is a scab  $\frac{3}{4}$  in in breadth with a pustular margin very like a variola but having no areola. Did not feel ill enough to wish to stay in hospital but on being warned he consented to remain. Admitted about 1 P.M. At about 3 P.M. of the same day he suddenly became unconscious and intensely dyspnoeic. Tracheotomy done immediately and artificial respiration carried out. Recovered and respiration became regular and rhythmical. Large tracheotomy tube introduced. A little later a median incision was made from the chin to the hyoid bone dividing the structures almost to the floor of the mouth. Thin serous discharge. No pus. Crepitation under the skin of the chest. At 10 P.M. dysphagia but no difficulty of respiration. Next day 9 A.M. good night increased swelling toward the chest. No fluctuation. No pain. 11 A.M. very feeble. Dyspnoea and considerable cyanosis of lips and face. 40 P.M. rapidly becoming livid and respiration more rapid. Gradually became comatose and died at 3.15 P.M.

*Autopsy*—Emphysema detected from eyelids to nipple. Well marked edema glottidis the edematous tissue partly resembling that found elsewhere though perhaps not quite so firm. Infarctions found in lungs. Bacteriological examination showed no specific pathogenic organism (It was of this case that Lockwood said that by different methods he later found the streptococcus in the tissues).

**CASE XII—POULSEN**—At midday day before yesterday patient observed a swelling of right side of his face and difficulty in swallowing. The swelling extended farther and farther toward the submental and parotid regions. To day (3rd day) mouth can be opened only slightly just enough to permit the introduction of a finger with which the isthmus of the fauces can be felt to be free. Floor of mouth considerably swollen on both sides. Swelling edematous but non fluctuating. No carious teeth. When the beard was being shaved suddenly he became dyspnoeic. Sat upright in bed and died in a few minutes. This was 3 hours after admission i.e. 2 days after the beginning of the attack.

*Autopsy*—Both parotid regions and upper part of neck considerably swollen. Some edema of subcutaneous tissue. Swelling most marked



in submental and submaxillary regions Foul, grayish, rather thick fluid between the muscles passing from lower jaw to hyoid bone Salivary gland somewhat thickened and its tissue to a slight extent infiltrated with this fluid The glandular tissue seems unchanged Same infiltration but with a clearer fluid invades the connective tissue of the neck. In the submaxillary salivary gland the infiltration of the connective tissue is somewhat more marked, and has the appearance of connective tissue pus and an inclination to abscess formation On the right side the gangrenous pus infiltration extends between the sternomastoid and sternohyoid and sternothyroid muscles to just above the thyroid gland It also extends along the blood vessels to the lower part of the thyroid gland On the left side the pus infiltration extended only a little below the submaxillary gland The lymph glands on both sides were somewhat swollen, but without pus The pus infiltration did not extend to the tongue nor to the sublingual gland Tonsils not swollen

Enormous œdema of the uvula, and of the mucous membrane of the pharynx, particularly in the laryngo-pharyngeal sinus and especially in the aryteno-epiglottic folds There was œdema also on the anterior surface of the epiglottis, a little on the posterior surface Very marked œdema on the sides of the larynx, even as far as the vocal cords, especially on the left side, where the upper surface of the left cord was very prominent In the left parotid gland there was œdema, and foci of pus infiltration in the connective tissue

CASE XIII —POULSEN —Man, 54 years, presents himself with a virulent phlegmonous swelling involving the left cheek, left retromaxillary region, and the lateral region of the neck Some swelling of the eye-lids Can scarcely swallow, and is hoarse, which symptoms are of a few days duration No real difficulty in respiration Mouth can be opened only slightly Numerous stumps of teeth present Fauces cannot be inspected As far as one can palpate there is found considerable swelling of the left side Epiglottis cannot be reached Patient says that condition has developed in last three days Before that he had suffered for a half day from difficulty in swallowing Temperature  $40.5^{\circ}$  Under chloroform, incision made in submaxillary region parallel to jaw Finger worked into a soft stinking pus infiltration of the connective tissues, as high as the mylohyoid muscles and posteriorly opposite the parotid as deep as the pharyngeal wall At no time did pus flow out, but there escaped from the cavity a putrid offensive odor Irrigation, iodoform packing Following day, temperature  $41^{\circ}/39.2^{\circ}$  Respiration freer, and swelling subsided Still a firm infiltration in submaxillary region Gauze removed and found to be putrid and stinking Another incision made downward No denudation of maxilla Patient collapsed Toward evening, temperature went up to  $41.1^{\circ}$  No dyspnœa

*Autopsy* —Diagnosis Gangrenous phlegmon of submaxillary region Pericœsophageal and laryngeal phlegmon Hyperplasia lienis In the larynx considerable swelling and infiltration, especially on the left side The swelling has a dusky, gangrenous appearance, as the infiltration itself, through an incision shows a dusky, gangrenous tissue Above the left

vocal cord is an abscess the size of a pea with thick yellowish pus in which were found numerous micrococci of various kinds especially long chains. The greatest infiltration is found in the intermuscular connective tissue on the left side of the trachea and larynx close to the internal jugular vein. The infection here extends to the left tonsil and the upper surface is the seat of gangrenous ulceration. The process extended downward around the œsophagus where almost to the heart was found a thick rather firm dusky infiltration of the connective tissue between the mucosa and the muscularis upon the posterior and left side. In the left submaxillary region the edges of the incision were almost black and gave a very offensive odor. (It is interesting in this case to observe the difference between the clinical and post mortem evidence of involvement of the larynx.)

CASE XIV—OMBREDANNE AND KEIM—Man 26 years Dec 29th at 9 P.M. patient arrived at hospital nearly asphyxiated. It was necessary to carry him. The swelling began on the 26th at the same time as an inflammation about a carious tooth. Dec. 28th dysphagia developed and already dyspnoea was present. Patient continued nevertheless to work. Respiration became more and more difficult. On admission 29th there was considerable suprahyoid hard swelling predominating on the left side. No fluctuation. Floor of the mouth slightly elevated and tongue swollen. Mouth full of mucus. Pulse 15. Submaxillary incision made 6 cm. long. 3 to 4 grammes of fetid pus escaped with the blood. While on operating table respiration became more difficult and stopped. Tracheotomy and artificial respiration revived him. Dec. 30th right side of neck more swollen and is enormous. Temperature 39.2 pulse 140. Patient calm. Swallows liquids. Dec. 31 incision posterior to angle of jaw on left side. No pus only blood. Temperature 39 pulse 161. General condition worse. From first incision bloody serum and bubbles of gas can be expressed. Jan. 1 swelling invades base of neck and thorax where crepitation can be felt. Jan. 3 swelling occupies whole thorax. Jan. 4 incision in right side of neck evacuates some drops of pus with blood and gas. Death at 7 P.M. with an intense dyspnoea. Face cyanosed. Tracheotomy tube is always in place and working freely.

*Autopsy*—Pleural cavities contain considerable quantity of bloody liquid and at the fissures were fibrinous deposits. Lungs engorged with blood and serum. Nevertheless they crepitated under the finger. A portion of the tongue floor of the mouth and soft parts of the neck were removed. The whole of the floor of the mouth especially at the angle of the jaw was transformed into a gangrenous mass. The muscles of the tongue are absolutely preserved and retain their red color but the pus has infiltrated in front of the trachea to behind the sternum where there was an extensive discoloration. The carotid glands were in full suppuration.

The epiglottis was œdematous turgescient and curved like a horse shoe the two ends touching each other. The aryteno-epiglottic folds were equally infiltrated especially the right which was nearly a centimetre

thick The glottis and trachea were red and injected No subcutaneous emphysema around the trachea wound Bacteriological examination showed streptococci, and staphylococci, the latter predominating Injection of the pus into one of the lower animals gave rise to an ordinary phlegmon without the development of gas

CASE XV—MACAIGNE AND VANVERTS—L, 62 years Entered hospital, March 12, 1896 Previous health good Found on waking on morning of March 11, that his neck was swollen and painful in the suprahyoid region Yet he worked all that day At 5 o'clock he was compelled to go to bed from fatigue, chills and high fever At 9 P M, March 12, swelling was considerably increased The lesion is deeply seated because the superficial layers of tissue move easily on it Skin normal Swelling of "woody" hardness Floor of mouth swollen and indurated Mucous membrane red Tongue pushed upward and backward Carious teeth Respiration difficult because of narrowing of isthmus of fauces by elevation of tongue Dyspnœa increased on slightest effort Speech difficult Some constriction of jaws Pulse rapid Temperature 38° General condition does not seem very grave At 11 A M, a few whiffs of chloroform were given and a long median incision made This was deepened to the mucosa of the buccal floor Neither a serous nor a purulent collection found Abundant blood escaped Dressing applied and patient taken back to bed A quarter of an hour later he was dead

*Autopsy*—46 hours after death Inspection showed that no pus collection had escaped the bistoury Larynx sound Aryo-epiglottic folds are not œdematous Lungs are normal All the organs are congested, but present no other lesion (The writer questions the post-mortem report of a sound larynx in this case Death in less than 36 hours was too rapid for septic intoxication The patient worked nearly the whole of the first day Temperature was only 38° (100½ F), and general condition said to be not very grave, at end of the first day Floor of mouth invaded by inflammation Speech difficult and dyspnœa on first day, increased on slightest effort Sudden death)

CASE XVI—BIEDERT AND ROBERTSON—Male, 22 years, admitted for typhoid fever of two weeks duration One week later, the typhoid being moderately severe, patient began to complain of some dyspnœa A swelling developed very rapidly on the left side of the neck, just below the angle of the jaw, hard and tender Dyspnœa increased and examination of throat showed an œdema of the whole of the pharynx and larynx and epiglottis, the larynx being almost entirely closed Six hours after the onset the dyspnœa had become so severe that tracheotomy became imperative This relieved him Temperature 103° External swelling continued to increase very rapidly and was very tender About ten hours after the onset he died suddenly Cause of death not clear

*Autopsy*—Four hours after death Typhoid ulcers in small bowel, particularly near the termination of the ilium Tissues of the neck very œdematous and swollen, but no evidence of breaking down Mucous membrane of larynx, particularly about the left vocal cord and epiglottis, was œdematous, greatly swollen and almost purple in color

*Bacteriological Examination*—Cultures taken from spleen by Dr Ghiskey showed the Eberth bacillus. Unfortunately no cultures were taken from the cervical region but a microscopical examination of the swollen laryngeal tissue showed a pure streptococcus infection.

A further study of the 104 collected cases and the writer's two gave the following results.

*Age*—The phlegmon was present at birth in one. In another it began on the 6th day, in a third at 3 weeks and in a fourth at 6 months. There were 7 cases between the ages of 1 and 10 years, 6 between 10 and 20 years, 33 between 20 and 30 years, 15 between 30 and 40 years, 12 between 40 and 50 years, 10 between 50 and 60 years, and 5 between 60 and 70 years. In 9 cases the only reference to age was that the patients were adults and in 5 there was no reference at all to age. The greatest number therefore occurred between 20 and 30 years. Poulsen's 251 submaxillary abscesses showed about the same proportion in this period. Between 16 and 30 years he regarded as the age of carious teeth.

*Sex*—Of the 106 cases there were 76 males and 20 females while in 10 cases the sex was not mentioned. Males being more exposed to changes in the atmosphere are probably more frequently the subjects of angina while among the poorer classes they probably give less attention to their teeth and are therefore more frequently sufferers from dental caries than females.

*General Health*—Murchison reported an epidemic of Ludwig's Angina in the Hebrides and found that previously impaired health was associated with most of the cases. He reported none of his cases individually so that none is included in the writer's list. His view has received little or no support in the literature. Of the writer's 106 there were only 15 cases in which the general health previous to the beginning of Ludwig's Angina was considered to be in any way impaired. Two of these were gouty, one insane, 5 alcoholic, one albumenuric, alcoholic and diabetic, one worn out by privation and long walking, one was in the early stage

of secondary syphilis, one, probably, had measles just preceding the beginning of Ludwig's Angina, in one the trouble developed during typhus fever, and in 2 during typhoid fever

There were 21 cases in which the general health was said to be good, and 10 others in which, from the vigorous occupations followed by the patients and the absence of any reference to previous health, it may be assumed that it was not essentially impaired. In 60 more there was no mention of the general health previous to the attack, or of anything which would indicate that it might have been impaired. The natural inference is that in these it was normal. In 90 of the 106, or 85 per cent of the cases, therefore, it may be assumed that previous to the beginning of Ludwig's Angina, the general health was practically normal.

*Primary focus of infection*—Dental caries was noted in 36 cases, in 4 the wisdom teeth being involved. So far as reference to special teeth is concerned, they were always molar or wisdom teeth, *i e*, those nearest to the submaxillary region. Angina was present in 11 cases, and in these there were no references to carious teeth. In one there was a wound of the mucous membrane just posterior to the incisor teeth, which had been broken by the kick of a horse. In one there was a wound of the chin. In another there had developed infection in the wound made by cutting a tongue tie. In one of the writer's cases the infection began in a similar wound resulting from a gun shot injury, producing a fracture of the lower jaw. In two cases there were ulcers on the side of the neck. In two others, otitis media seemed to be the primary focus. In one the trouble began with a peritonsillar abscess, and in one secondary syphilis was present, probably, giving lesions in the mouth and on the skin, which would account for mixed infection of the lymphatic glands. In 49 cases there was no mention of a primary focus other than the cellulitis in the neck.

*Swelling in floor of mouth*—In 81 cases this symptom was noted. In 8 one is left in doubt as to its presence by

the description of the case while in 17 no reference is made to it. From the associated symptoms the writer would infer that it was present in most of these 25 cases if not in all. With the jaws so close together that one can not see the floor of the mouth without special efforts and the finger can be introduced only with difficulty this symptom might easily be overlooked.

*Difficult speech*—Disturbed speech was mentioned only in 38 cases. In 4 the patients were too young for speech. The absence of mention of this symptom in so many cases is a matter of little importance since it is not a valuable symptom. Speech must be more or less disturbed whether the case be one of localized submaxillary cellulitis or true Ludwig's Angina from the failure to open the mouth and the limitation of the movements of the tongue due to the fixation of the suprahyoid muscles going to it.

*Dysphagia*—This symptom was mentioned only in 68 cases but was said to be absent in only one. Like disturbed speech it must have been present in many more and for the same reasons.

*Dyspnoea*—This symptom was present in 81 cases was not mentioned in 20 and in three was specifically said to be absent. In two others there were syncopal attacks.

The writer has tried to show that Ludwig's Angina probably kills in the great majority of cases by invasion of the respiratory tract first of the larynx and later in some cases of the lungs. The fact that dyspnoea could be overlooked in 20 cases and could have been reported absent in 3 cases out of a total of 106 implies that in a fair percentage of cases death occurs without oedema of the larynx. The writer however has become convinced during his study of this subject that not all cases of oedema of the larynx give prominent and positive symptoms upon which the diagnosis can be easily made.

In the first place the two cases showing syncopal attacks without any mention of dyspnoea were suspiciously like cases of laryngeal involvement. Death from syncope occurred in

Nelaton's case in which the submaxillary swelling was enormous and became bilateral, and the floor of the mouth was involved. In one of Huguet and DeBovis' cases, syncopal attacks occurred in a new born infant, but there was in this, as in Nelaton's, no mention of dyspnoea. There was sublingual swelling also. That dangerous involvement of the larynx may occur without the development of dyspnoea is shown by Poulsen's case (see autopsy case No XIII). There was said to be no dyspnoea in this case, and yet the autopsy showed considerable swelling and infiltration of the larynx, especially on the left side, dusky and gangrenous in appearance. Above the left vocal cord was an abscess the size of a pea, and the process extended downward around the oesophagus in the submucous tissue almost to the heart. If dyspnoea can be absent in a case of this kind, then it is probable that oedema of the larynx existed in many of the 20 cases, in which dyspnoea was not mentioned.

Parker, writing on tracheotomy in laryngeal diphtheria, says "Membraneous laryngitis begins in one of two ways, primarily in the larynx and by extension to the larynx. In the former the chief symptoms are those of suffocation outweighing and hiding all others. In the latter the laryngeal symptoms are preceded by those of depression and blood poisoning. As a rule this spread (to the larynx) is *very gradual* and *very insidious*. In consequence of the antecedent blood poisoning, but chiefly of the very gradual onset of the disease, the body becomes reconciled to its deprivation of oxygen, hence the suffocative symptoms, which are so prominent and so distressing in the other variety, are less marked, indeed often absent in this. Sometimes medical practitioners have themselves underestimated the gravity of the disease on account of this apparent absence of discomfort in their patients."

J Solis Cohen, writing on the symptoms of oedema of the larynx, says "Acute oedema of the larynx occurs so suddenly at times that the subject perishes without any premonitory symptoms whatever. Van Swieten mentions a case,

of death with sudden change in the voice while dining. Morgagni mentions a similar case in a physician who suddenly became hoarse and died at once. Porter knew of two young men found dead from oedema in the morning without any complaint having been made by them the night previous. Ruehle mentions a young man with swollen tonsils and overheated by dancing found dead in the morning from oedema which had suffocated him without awakening him and like wise the case of a servant girl slightly hoarse who went out lightly clad in the morning and was suffocated while going up stairs on her return. Roger while an interne at Hotel Dieu was summoned to an attendant in an adjoining ward who died of suffocation before he could be reached and yet there had been no complaint save of a sore throat so slight as not to interrupt the man's work in the hospital. These instances of sudden death certainly seem to indicate a sudden occlusion of the glottis from spasm of its constrictors rather than a mechanical death from serous effusion. It is quite probable that the oedematous condition may have existed for some hours or days undetected and unsuspected and that some sudden inspiration of dust or of saliva has produced an immediately fatal spasm. The writer believes that there is abundant proof in the preceding statements to show that a patient may die from oedema of the larynx in Ludwig's Angina without recognition by the attending physician of the laryngeal condition.

*Diagnosis*—The first essential in making a diagnosis of any pathological condition is to have a definite conception of what that condition is. The writer's idea of it has been so fully set forth already that little more need be said on the subject. It may be permitted him to repeat that what Ludwig described was a virulent cellulitis beginning in the sub-maxillary region rapidly spreading to the adjacent connective tissue of the neck and then into the floor of the mouth and pharynx in consequence of which the patient's life is threatened partly from septic intoxication but chiefly from invasion of the respiratory tract i.e. the larynx primarily.



and in some cases the lungs, secondarily Those cases in which the phlegmonous process begins in the throat in the immediate vicinity of the larynx have been purposely excluded, for reasons already given Those beginning in the floor of the mouth are not so easily disposed of, and these the writer is inclined to include with those beginning in the submaxillary region and invading the floor of the mouth, secondarily Those beginning in the floor of the mouth practically always extend to the submaxillary region, secondarily, as may those beginning in the throat, but the latter not so constantly nor so quickly for obvious reasons It will thus be seen that a Ludwig's Angina is not actually present until the sublingual phlegmon has developed Its diagnosis, therefore, depends upon the recognition of the latter condition

While in a case of submaxillary cellulitis still localized to the tissues of the neck, it would be folly to wait for the signs of Ludwig's Angina to develop, it is vital to be competent to recognize this condition when it is already present With rare exceptions the teeth will be forced so close together that a finger can be introduced only with difficulty In most cases, however, it can be introduced and by it the swollen, indurated and inflamed floor of the mouth can be felt In some cases it can be seen without any effort to expose it, and in most cases by separating the lips and teeth as far as possible The tongue will be elevated and may protrude between the teeth Pain and a feeling of fulness will be experienced by the patient within the mouth Disturbance of speech and deglutition will be more marked than in a case of simple submaxillary cellulitis Those symptoms and more particularly dyspnoea all speak for a Ludwig's Angina

About the only attempt at a differential diagnosis that the writer found in literature was that of Leterrier, although his ideas have been repeated by a few other writers He said that osteoperiostitis of the inferior maxilla, adenophlegmon and hygroma of Fleischman's bursa, are the only affections with which one can confound a sublingual phlegmon An osteoperiostitis of the lower jaw is generally a

local inflammation and is usually the result of a carious tooth. In most cases which the writer has observed it involved the external portion of the jaw. If it involved the internal surface of the jaw it would probably still be localized but if it gave a rapidly spreading cellulitis of the floor of the mouth which is adjacent to it it would then be essentially a Ludwig's Angina because a sublingual phlegmon when there would be no occasion for a differential diagnosis. If distinctly localized there would be none of the characteristic symptoms of Ludwig's Angina and this condition would not be suggested. But such cases should receive prompt attention i.e. they should be disinfected and drained at once to prevent a possible extension to the floor of the mouth which must always be a dangerous condition.

In an adenophlegmon Leterrier says one finds small rounded masses painful and distinctly separated from each other he further says that a sublingual phlegmon gives a single mass with special characteristics and occupying at least a part of the submaxillary region. That an adenophlegmon can give an extensive single mass in the submaxillary region the writer believes is a matter of common knowledge and hardly needs discussion. The cases of Ludwig's Angina beginning as small localized swellings to which the writer has already referred are in all probability instances of this kind. An hygroma of Fleischman's bursa which is situated under the tongue could hardly be confused with a Ludwig's Angina since it is not inflammatory and is distinctly localized and movable on the surrounding tissues.

The only condition which in the writer's opinion could be confused with a Ludwig's Angina is a localized submaxillary cellulitis or rather an extensive cellulitis in this region which has not invaded the mouth or pharynx. Indeed it is only this condition which has been confused in the literature with Ludwig's Angina and the writer has found it necessary to exclude a number of these cases which were reported as Ludwig's Anginas. Gasser for example reported four cases in all of which the streptococcus was found. The

writer excluded three, because he could see nothing more than submaxillary cellulitis in them. The extension to the floor of the mouth and pharynx is what determines a Ludwig's Angina in these cases, and working upon this basis, the diagnosis should be comparatively easy. That the term, Ludwig's Angina is still useful in describing this extension, the writer believes.

*Prognosis*—The prognosis of a sublingual phlegmon, which is the essential condition in a Ludwig's Angina, in the writer's opinion, will vary according to the virulency of the infection and, therefore according to the rapidity with which the mouth and pharynx are crowded and the larynx reached by the inflammatory process. There is also the lesser danger of septic intoxication which, of course, varies according to the virulency. Pyaemic deposits from invasion of the blood vessels, especially the veins, by the infection have resulted in a few cases, but neither this nor the septic intoxication is, probably, any more to be feared in Ludwig's Angina than in similar infections of other parts of the neck or body. Above all the prognosis will depend upon the promptness with which the condition is recognized and upon the thoroughness of treatment.

In a considerable number of cases, although free incision was made no pus was found and in these death usually resulted. Where pus was found early a cure usually followed, although in some other foci existed and a fatal termination was the result. The writer believes that some of these as well as some of the cases in which no pus was found by incision, are to be explained by the fact that one or more lymphatic glands being involved, the foci of infection were still intraglandular in some or all of them, and the incision missed them. Similar periglandular cellulitis is common in the inguinal region, where it is the rule not only to evacuate the pus, but to shell out all inflamed glands, for we have learned by experience that the inflammation in these cases will frequently continue after a considerable abscess has been thoroughly opened and properly drained. The well known

tendency of streptococcus to develop serous rather than purulent exudation in some cases as in erysipelas will explain the absence of pus in many. Of the writer's 106 cases 43 died and 63 recovered. The more recent cases however have given much better results than the earlier as in Ludwig's time because of earlier recognition and more prompt and thorough treatment. There can be little doubt that a better appreciation of the pathology of this condition will lead to better results in the future.

*Treatment*—Antitoxines are not our only hope for the future in those cases as Semon says. Prompt surgical interference will probably always be of first importance. There has been considerable difference of opinion as to what this should consist of. Although spontaneous openings when they have occurred have almost invariably been found in the mouth incisions there have not given satisfactory results and it is generally conceded that the external incision is best. Surgical experience has taught that incisions should first of all lay open freely the focus from which the infection is spreading. The focus in these cases is not the preliminary insignificant lesion tonsillitis carious tooth etc. which however should receive suitable attention but the lymphatic gland in the submaxillary region or the infected wound ulcer phlegmonous inflammation about a tooth etc. from which the infection is extending directly to the adjacent connective tissue. If this focus is on the surface within the mouth an effort should be made properly to expose and disinfect it as with pure carbolic acid. Care must be observed of course to prevent the caustic from doing damage to surrounding parts. When this was done in one of the writer's cases prompt subsidence of the inflammation and a cure followed. If such a focus is in the pharynx it will be practically impossible to reach it and as in Semon's cases treatment will be of little avail. Spontaneous resolution with or without spontaneous opening or an effective antitoxine are about all we can hope for.

When however the cellulitis originates in the sub-

maxillary region, the focus is, probably, in one or more of the lymphatic glands. It is in these cases that the best results have been obtained. This is, undoubtedly, due to the fact that the inflamed area, from the beginning, is better exposed for recognition and treatment. The dangerous invasion of the floor of the mouth and the pharynx is a later development, thus giving more time for arresting its progress before it reaches the larynx or lungs. Delorme reported that in one of his cases the submaxillary salivary gland was exposed without the location of pus, and that the prolongation of the incision towards the median line and through the mylohyoid muscle, located pus. There is room for question whether in such a case the salivary or a swollen lymphatic gland was exposed. The incision of necessity is a deep one in the presence of the massive, indurated exudate, which is always present. Hemorrhage is free and retraction of the edges of the wound difficult. A swollen lymphatic gland may readily be of the same size as the normal salivary gland, and under these circumstances in the absence of an opportunity to scrutinize its structure carefully the one might easily be mistaken for the other. The writer believes that in Delorme's case the pus first developed where the swelling was first observed, in the submaxillary region, and if the submaxillary salivary gland had been freely exposed by the incision it would have located it. If, however, an outlying lymphatic gland were exposed the pus collection might have been overlooked until its extension through the opening in the floor of the mouth had been reached by the extension of the incision forward and through the mylohyoid muscle.

The best incision is undoubtedly the one which Delorme selected, *i e.*, over the submaxillary gland and parallel with the lower jaw. The frequency of the spontaneous openings in the floor of the mouth and the fact that a number of writers have reported that they did not find pus until the mylohyoid muscle had been divided, indicate that this muscle should be freely divided, at least unless frank suppuration is found before it is reached. The dangers of an external

incision increase as we approach the angle of the jaw where the largest blood vessels of the neck and head as well as the largest branches going to the face are located. They are all practically posterior to this gland. The facial vein lies over it and the artery under it. The gland lies in front of the angle of the jaw and from the anterior border of the masseter muscle where the pulsation of the facial artery can be felt as it crosses the border of the jaw forward to the symphysis there are no blood vessels large enough to be feared. The anterior part of the submaxillary incision therefore should give little or no trouble while with a little care it can be safely extended backward far enough to expose the region of the submaxillary gland freely. The mylohyoid muscle may be penetrated with the knife finger or a grooved director. The finger should be passed upward in the wound until only mucous membrane intervenes between it and the mouth.

Many writers have employed the median incision from the chin to the hyoid bone. It is safer than the submaxillary incision since there are no blood vessels in the median raphe or only small ones. If Ludwig's angina were merely a sublingual inflammation i. e. beginning in and essentially localized to the sublingual tissues as Delorme maintained one would expect that Delorme would select the median incision to evacuate the pus as it is the ideal incision for an abscess located under the tongue. Yet he employed the submaxillary incision in all his cases and this incision has been called by a few French writers following his paper the Delorme incision. The median incision carried through the mylohyoid muscle may find pus in the floor of the mouth in the typical case of Ludwig's angina but only after it has extended along the floor of the mouth from the submaxillary region.

The point of greatest importance however in connection with this whole subject is to recognize the dangerous possibilities of every submaxillary cellulitis and to open the infected area promptly and efficiently. If we have waited too long or our efforts have not been effectual and asphyxia is

threatened, a tracheotomy must be done at once with the hope that the process may soon subside and recovery follow. Intubation is out of the question, at least in most cases, because the mouth can not be opened and the tongue is pushed up. Artificial respiration may be necessary to tide the patient over the crisis. The question of the anaesthetic is an important one. Local anaesthesia has been employed several times and Davis emphasizes its value. When the dyspnoea is marked the added burden of a general anaesthetic is not a trifling one. It would seem that local anaesthesia should then receive the first consideration.

*Conclusions*—The condition known as Ludwig's Angina, is a rapidly spreading cellulitis, beginning in the region of the submaxillary salivary gland as a perilymphadenitis, and extending to the floor of the mouth and pharynx. The primary focus is some neighboring surface lesion as a carious tooth, tonsillitis or ulcer in the mouth.

The infecting organism is, usually, the streptococcus, alone or mixed with other organisms, as the staphylococcus, pneumococcus, or bacillus of malignant oedema, but it may be the staphylococcus alone or any organism capable of producing a rapidly spreading cellulitis.

Death results from invasion of the larynx in most cases. In a considerable number the lungs are also involved. The associated septic intoxication is, probably, no more severe than that which results from streptococcus infections of the same grade in other parts of the body.

The opening in the muscular buccopharyngeal wall, through which the submaxillary salivary gland projects into the floor of the mouth, is the path by which the submaxillary infection invades the mouth and pharynx.

Any rapidly spreading cellulitis in the floor of the mouth is a menace to the life of the patient, as the anatomical conditions there, favor the early involvement of the larynx.

It is this invasion of the floor of the mouth and the pharynx which determines the alarming symptoms characteristic of Ludwig's Angina. It is evident, therefore, that

a cellulitis of a given grade of severity beginning in the floor of the mouth is more dangerous than one beginning in the submaxillary fossa since the larynx will be more early and surely invaded. The opportunities for recognizing and checking the danger are therefore correspondingly lessened. For the same reasons the most dangerous cases are those in which the phlegmonous process begins in the pharynx or in the larynx the danger being greatly increased in these because even if recognized immediately the parts can not be inspected or properly incised and disinfected.

The pathological changes occurring in the infected area do not differ materially from those which may be expected from any severe pyogenic infection occurring under similar anatomical conditions. The proximity of the alimentary tract explains the frequency of gas and putrescence in many cases in which gangrene was not reported while the intensity of the inflammatory process and the compression of the inflammatory material inside the jaw and under the tongue accounts for the frequency of gangrene.

The condition occurs with sufficient frequency and is sufficiently constant in its clinical course to deserve a place as a morbid entity. No name is at the same time so brief and so comprehensive as that of Ludwig's Angina. Those cases in which the cellulitis originates in the floor of the mouth may be included with advantage among the Ludwig's Anginas. Those in which the phlegmonous process begins in the throat should form a separate group from the standpoint of prognosis and treatment.

Modern surgical treatment has reduced considerably the number of cases in which irregular septic temperature, profuse sweats, delirium and a progressively profound typhoid state occur.

Incisions in the floor of the mouth may be advisable in a few cases for the relief of excessive swelling but they have rarely given satisfactory results. The median suprahyoid incision while the safest of the external incisions does not expose the usual primary seat of infection and should not be



selected, except to evacuate an evident purulent collection in the submental region. The submaxillary incision, *ie*, over the submaxillary triangle and parallel with the lower border of the jaw, will, probably, locate an existing pus collection in the greater number of cases. If frank suppuration is not found before, the mylohyoid muscles should be divided and the sublingual tissues exposed.

On account of the added irritation of a general anaesthetic to an already dangerously inflamed larynx, local anaesthesia will in all probability prove to be the more valuable means of controlling the pain during the making of the incision.

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# STUDIES IN TECHNIQUE OF CANCER OF THE BREAST OPERATION.\*

BY ROBERT H M DAWBARN, M.D.,

OF NEW YORK.

Surgeon to the City Hospital and to the Polyclinic Hospital

ALTHOUGH such an immense amount of superb work has been done in the extirpation of cancer, especially in recent years, it would appear that as long as our statistics continue to show so large a percentage of relapses, the operation is one in which further study on the part of all surgeons should be encouraged. It is my purpose in this paper to dwell upon certain points, some quite old, but not less valuable on that account—which, so far as I am aware, are not as generally employed as they seemingly should be, and one or two further points which are evidently of more modern origin. Of the first named group, that to which I shall first call attention, is a suggestion of the late Mr Syme, founded on his great clinical experience. This surgeon stated with emphasis his belief that whenever an operator was not perfectly certain of the correctness of his diagnosis of mammary carcinoma because of the absence of one or more of its cardinal symptoms—such as retraction of the nipple—his first operative step should be to cut with a single stroke into the very midst of the supposed neoplasm, this for the reason that it had more than once happened to himself, and still again to some of his colleagues, that after its extirpation a supposed cancer proved to be a very thick walled abscess containing perhaps only a minute quantity of pus. By this precautionary incision the possibility of unnecessarily mutilating a woman is averted. I have personal reasons for knowing how deceptive one of these abscesses may prove to be. Thus I recall in particular the case of a patient aged 40 operated upon by me in the New York Polyclinic Amphitheatre some years ago, in which there

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\* Read before the New York Surgical Society, Nov 27, 1907

was neither history of fever nor especial tenderness in the apparent new growth (first noticed one year before) Retraction of the nipple was absent but this was readily accounted for by the situation of the mass which was seemingly in an outlying lobe of the breast gland on a line between the nipple and anterior axillary fold On the other hand enlarged axillary lymph nodes could readily be palpated high up In a word I am sure I should find this clinical picture as deceptive to-day as it proved then After removal as usual of the axillary contents and breast the supposed neoplasm was divided and was found to contain some two drachms of pus (shown later to consist as to microbic components of various staphylococci in almost pure culture. The walls of the abscess were fully three-fourths of an inch in thickness and were especially dense. In this particular type of case it would seem almost certain that an approximate balance had been attained between the status of the microbic invaders and that of their cellular antagonists neither being able to overcome and dispose of the other We may suppose on the one hand that from exceptionally favorable local situation in the tissues attached phagocytic action had been unable to prevail over them—so that the pus excitors became gradually surrounded with a wall of new connective tissues which of course grew more and more dense with the advance of time Upon the other hand we may believe that the pus excitors although securing just enough nutriment to maintain their own vitality had nevertheless been unable to multiply greatly nor could they spread infection elsewhere Whether this explanation be correct or incorrect the clinical fact remains In addition to my own case just narrated I have known personally of two others of the same type both of which occurred in the practice of local surgeons By an odd coincidence one of these cases was almost exactly contemporaneous with my own A member of the class of graduates who was a witness of my own unfortunate operation rose from his seat immediately after its completion and the division of the supposed neoplasm and stated that he with several others of the class had attended on the very

day preceding, a clinic at one of our local hospitals, at which the visiting surgeon had diagnosticated a case as one of breast cancer, but had turned the operation over to the house-surgeon. After the extirpated mass had been laid open, all present had a chance to see that it consisted of a very small abscess with surprisingly thick walls.

To substitute the diagnostic use of a coarse aspirating needle for the knife in such cases would hardly be regarded as justifiable, in my opinion, by surgeons in general, for should no abscess be present, but malignancy instead, this procedure might well open fresh channels through which the cancer could rapidly extend. Even with the patient already upon the operating table, the routine use of the aspirating needle could hardly be sanctioned. It does seem, however, that with Syme's procedure brought up to date any possible disadvantages inseparable therefrom would be greatly outweighed by the manifest advantages of such a step. In order to discount the possibility of extension of the infected area by the incision, I recommend that after a single bold stroke of the knife—which will differentiate immediately between abscess and cancer—the wound be tamponed forthwith, if pus is absent, with gauze soaked in Harrington's fluid or simply in boiling water wrung out the moment before such packing. With either liquid all lymphatic mouths will at once be sealed. If the gauze is well wrung out, enough absorptive power will remain to take up any lymph conceivably gathered in the second or two intervening between incision and packing.

When my first instance occurred I had not known of Mr Syme's urgent counsel concerning these deceptive cases, but ever since then I have never neglected to follow his advice (having used at first tincture of iodine in place of the other styptics just enumerated).

There comes next in order for discussion the recommendation of another eminent surgeon, made at a period considerably later than the first but apparently as little heeded by the profession. I refer to the advice first advocated, as research \*

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\* American Journal Medical Sciences, 1888, vol 95

shows by Prof A G Gerster—to reverse the usual order of procedure and invariably to attack the armpit first the breast last. It has seemed to me during the score or more of years since I first knew of this suggestion a matter of wonder that it should be so ignored. It is plain that when thus performed the difficulty of the operation is in no wise increased while a great advantage accrues to the patient in the elimination of a very real source of jeopardy to wit the greater or less amount of squeezing or so to say massaging of the breast by the retractors during its ablation as also its handling when separated save for its attachments to the armpit it is used as a kind of handle to aid in dissecting out the axillary contents with which it is continuous.

It must have been the lot of every surgeon of average experience to have known of reported instances of very rapid redevelopment of cancer after apparently radical extirpation and next appearing as a return in loco most commonly within the armpit or the thorax and after such a terribly short interval as to compel the conviction that the operation had shortened rather than prolonged the span of life that it had added to the misery of the patient while depriving her of the reasonably long free interval in the hope of which gain at least she had submitted to mutilating operation.

If as Prof Gross Jr has also shown the lymphatic connections between the tumor and the interior of the body are easily and safely divided and abolished when the axilla is attacked first in order of procedure the breast last then it should no longer be held justifiable for the surgeon to run any risk of squeezing cancer juices—*i e* lymph containing cancerous epithelial cells—into the general circulation by manipulations of the breast incidental to its removal in the order almost universally practised.<sup>1</sup>

A letter received this autumn from Prof J Chalmers

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Of course the wise teaching dating from such recent years to remove the pectorals the breast its tumor and all in a single mass unquestionably lessens the peril of the reversal of the proper order of attack by the surgeon there is less inevitable massaging of the lymphatics by retractors etc—still there must be some and there never was a danger

Da Costa expresses his hearty approval of Prof Gerster's advice in this regard. He proceeds to state that as a young graduate he was an assistant of the junior Prof Gross, and has, as such, personal knowledge of the latter's views upon this topic. The letter goes on to say, "Gross became convinced that the proper course of procedure was to open the axilla first and remove the connections there before attacking the breast. He was originally driven to do this, however, for another reason than the entirely scientific one of Gerster's originating and of which you speak. He began with the armpit, in instances presenting large axillary lymph-nodes, because he felt that if he should then discover that the axilla could not be freed clearly, there was no use in performing the remainder of the operation."

Prof Da Costa adds that he is perfectly convinced of the truth of the contention that the axilla should be first attacked, and "that the ordinary method of procedure *does* offer serious danger of milking lymph glands filled with cancer cells into aberrant directions and perhaps to considerable distances."

As a third reason for attacking the axilla before the breast, we have the importance of saving every possible drop of blood, for as will appear directly the axillary attack enables us to secure a notable degree of prophylactic hemostasis. After the pectoralis major has been divided near its insertion it is easy to observe those branches of the axillary artery and vein

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to the patient more unjustifiable, nor one more certainly and unobjectionably overcome, than this, by Prof Gerster's suggestion dating from so long ago. As a further means of protection against the spread of cancer in consequence of handling and retracting, etc, while removing the breast-mass—for the danger of passage via the lymphatic vessels that enter between the ribs is not wisely negligible—the writer always seizes with a Valsellum forceps and lifts vigorously away from the chest wall during this very rapid dissection close to the ribs, and an assistant follows the advancing knife with a spread out towel, which is thus made to intervene between the cut and open-mouthed lymphatics and possible danger to them from the mass being detached.

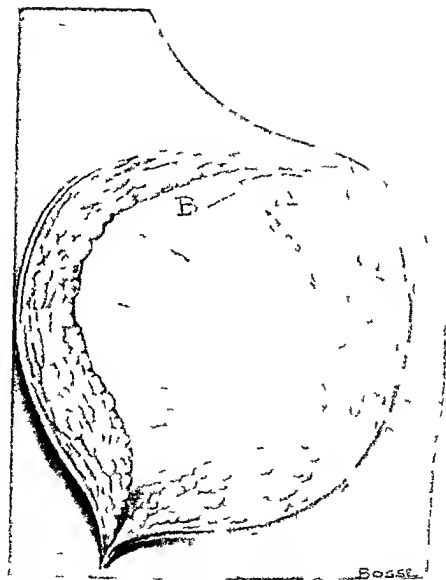
The writer's colleague, Prof Bodine, by choice seizes the nipple as a tractor during the breast ablation.

which supply the chest wall—notably those two quite regular ones the superior thoracic and thoracic longa which are found following the upper and lower edge respectively of the pectoralis minor. These and any additional ones seen passing chest ward should as a rule be tied twice and divided between before cutting the tendon of the muscle. To reverse this procedure and begin at the breast means hemorrhage from a multitude of little twigs which requires considerable time and pains to control—all needless. Of course the main blood supply of the breast comes from the perforating arteries of the chest wall and cannot be so reached. But since I have adopted the custom of cording the lower extremities close to the trunk allowing thereby the accumulation of large quantities of blood in the limbs until the pulse becomes noticeably softer than when such segregation has not been practiced I have found the amount of blood saved by this means to be truly remarkable (I employ this same resource before any bloody operation upon the head or trunk). Of course when the constricting bands are removed the heart's action becomes in consequence vigorous and the multitude of little vessel mouths would if neglected bleed sharply. It is necessary therefore to seal them up by securing a firm coagulum in their mouths and this is best done by applying to the chest wall a towel wrung out of water brought actually boiling at the table side the hands being protected by thick rubber gloves. It is obvious that the hotter the water the better for then the surface turns pale almost at once from coagulated albumin and fibrin. Were the water less hot it would be less safe as an application the surgeon being compelled then to use it for a longer time than if very close upon  $212^{\circ}$  F. to accomplish the necessary vessel sealing and would thereby run the risk of actually cooking the flesh. In localities of high altitude in consequence of which the usual boiling point cannot be reached and where the surgeon is operating without the advantage of a steam sterilizer (by which he is able to raise the temperature to any desired point) he may nevertheless substitute for plain boiling water



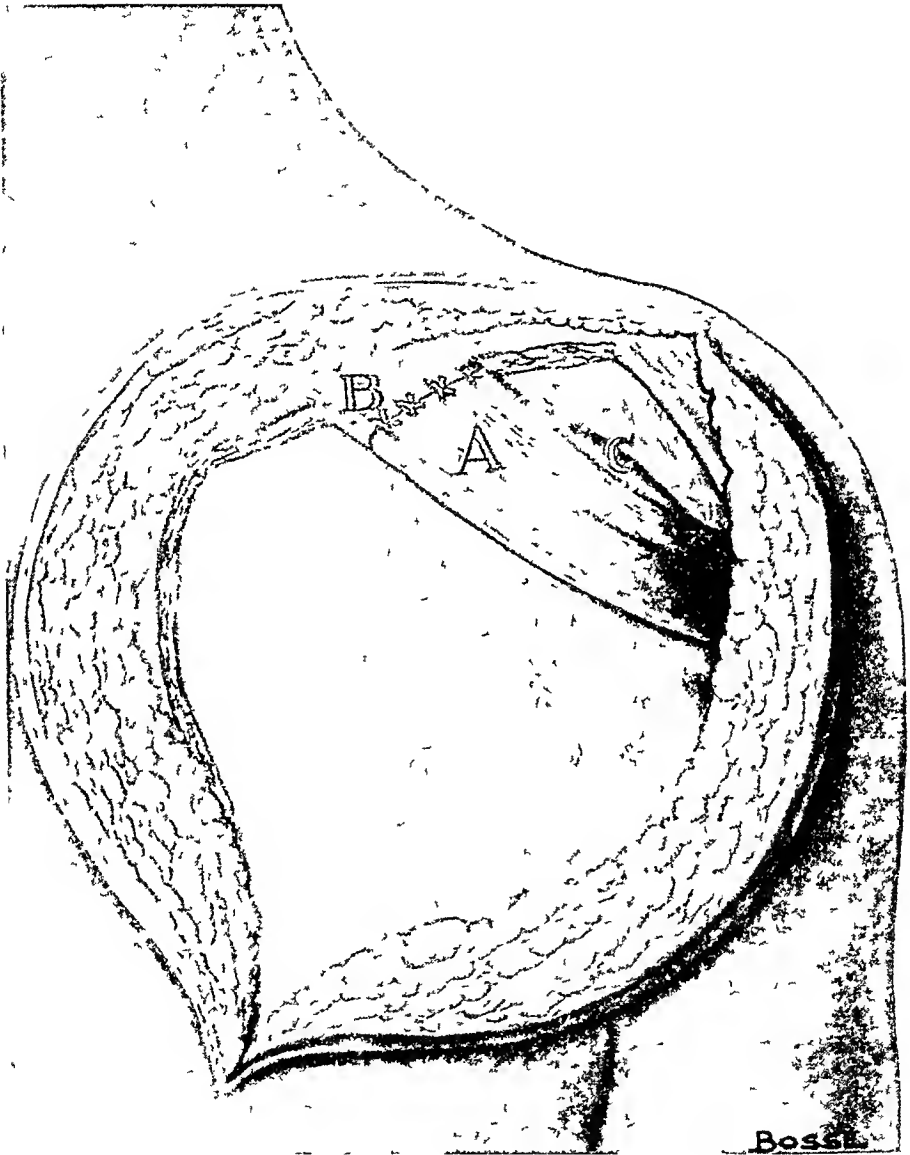
a water made more dense with salt, borax, or other rather unirritant soluble chemical, and which will thereby raise its boiling point to  $212^{\circ}$  or approximately so

The next topic to which I would beg to refer bears upon the fact that after both pectoral muscles have been removed our patients have no other means than the action of the anterior fibres of the deltoid for the advancement of the arm nor for its adduction. When one considers the point of origin of this portion of the deltoid, it is at once obvious that if this part of the muscle sprang from the inner rather than the outer half of the clavicle its power to produce such motions would be greatly increased. Bearing this in mind, I have for several years past quite regularly adopted a plan of muscle anastomosis indicated in the illustrations, (Figures 1 and 2) the detachment from its origin of an inch (more if thought necessary) of the anterior fibres of the deltoid, the muscle being split in a direction parallel to its long axis for a distance quite short but sufficient to permit the detached portion to be sutured to a stump, of corresponding size, of the adjacent pectoralis major. This resource is of course contraindicated if the cancer extends to the vicinity of the muscles involved in such contemplated anastomosis, but this relatively seldom occurs. The stump of the great pectoral may be left an inch long (sometimes longer) in order to permit the more ready accomplishment of union of muscle to muscle. On the other hand the deltoid, as just stated, is dissected as far as it is to be so used from a level as close to the collar bone as possible. I have found three medium twenty-day tanned chromic catgut sutures to be quite sufficient, and the entire little procedure adds only some five minutes to the length of work. As a rule it is easy to avoid injury to the cephalic vein,—the preservation of which is at times so important,—the deltoid slip being fashioned so as to cross obliquely in front of the vein. So far as I have been able to determine, the portion of the deltoid entering into the anastomosis is not deprived of its innervation, nor does it undergo atrophy, though obviously, to avoid this, it should be split down for as brief a distance as good work will permit. On the other hand it does secure what is intended,



M l t m (A) D h d m l h w p l f c f t m with  
t mp (B) f p c t r a l m j (C) C p h l

FIG 2



Muscle anastomosis Deltoid muscle (A) sutured to stump of pectoralis major (B) Cephalic vein (C) behind deltoid slip



Show g t ng l pl t pl alth h t padd d

FIG 4



Showing ease with which patient, 75 years old, third week after operation, places hand above her head. The short, skin deep cuts, aiding avoidance of skin grafting are noticeable. In one instance their number was nearly 100, yet requiring but five minutes. A year later no sign of them remained.

namely facilitation of flexion and adduction of the humerus. A friend has just recently pointed out that in the book entitled *Post Operative Treatment* by Morse of Iowa—published last year—there is to be found and credited to me a description of this modification of the operation for cancer of the breast. It is evident that some medical reporter present at one of my clinics had taken notes as to this feature without calling my attention to the fact. Dr. Morse found the matter as thus reported in the *Albany Medical Journal* and reproduced it in his work. It is regrettable that the description is in several respects quite inaccurate—for instance the statement that my preference is for a skin incision well towards the back of the armpit—the exact reverse of this being the truth.

As a final suggestion of those which the writer is considering in this paper comes in its natural order a point in the after care. A woman who has recovered from the operation under discussion is always anxious to be able as soon as possible again to lift her hand above her head so that she may do her hair. When—as is commonly the case—the arm at the end of the operation is bandaged close to her side much delay and oftentimes untold misery ensue in consequence before the axillary scar undergoes through her efforts a sufficient degree of stretching to permit of so radical a change of position.

For some years the use of a triangular splint whereby the arm is abducted somewhat from the side (though not advanced [flexed] at all) was made use of by me as well as by various other surgeons and found unquestionably to possess a distinct advantage. More recently however I have employed the triangular splint in an entirely different position and with such satisfactory results both as to patients' toleration of the dressing in this posture and added advantage in ready elevation of the arm after healing is accomplished that I now feel in position to speak in positive terms of its helpfulness. The accompanying figures illustrate this gain almost without the need of words. They were taken at the end of the third week after operation. That numbered (3) shows the patient with splint in place (although not properly padded as comfort requires when in actual use). That numbered (4) shows the ease

with which the patient—an old lady—was able to lift her hand above her head after this brief period of time. This woman, nearly seventy-five years old, is a patient of Dr Henry Moeller of this city, and was operated upon this August (1907) at the French Hospital. Her case was selected to photograph because of her age, she being the oldest patient upon whom I have made use of this position of the upper extremity *post-operationem*, and hence the most rigid test I have of its value in so speedy a return to comfort in doing the hair. When the splint is in place the patient's palm rests on the back of her neck, the front of the forearm lies in contact with her cheek, while the elbow looks directly forward and is from nine to twelve inches anterior to her chest wall, this measured distance being of course taken with thorax uncovered and not as in actual splinting, with the triangle resting upon the thick dressings bandaged in place. Any one who has slept with the hand behind the head knows that this position is not necessarily a constrained one. The "Z O" plaster is employed for fixation, a strip of it as wide as the patient's wrist starting at the back of the opposite shoulder, thence running along the back of the hand and forearm to the elbow, where it splits into two tails and is wrapped spirally about the upper arm and that side of the triangle in contact with it. This splint—resting on top of the thick chest-dressings and not put in place until these are completed and bandaged in place—rests as shown in the photograph. It is similarly made secure with the plaster, a piece of which three or four inches wide should pass vertically from well below, up through the triangle, continuing under the forearm and ending on the skin over the shoulder blade. In the photograph marked No. 4 the scar of the drainage wound is shown, at the lowest point and close to the axillary edge of the scapula. Further, the numerous relaxing incisions into, but never through the true skin, are plainly to be seen. Without these incisions, plus subdissection to the opposite edge of the sternum, it would very likely be of uncommon occurrence to secure entire closure of the wound without resort to skin grafting, bearing in mind the extreme sacrifice of skin about cancer which wisdom demands.

# RUPTURE OF THE LUNG WITHOUT COSTAL INJURY

WITH THE REPORT OF A CASE.\*

BY ROBERT G LE CONTE M D

OF PHILADELPHIA PA

Surgeon to the Pennsylvania Child Hospital

**CASE.**—James McG aged eleven white was admitted to the Children's Hospital January 10 1906 at 11 30 A M He had been run over by a rubber tired brougham the wheel apparently having passed over the the lower thorax On admission the patient was cyanotic with labored and rapid breathing pulse rapid and irregular He was unable to lie down on account of pain in the left side of the chest and difficulty in breathing There was a slight lacerated wound over the left eye produced by the horse's hoof The pupils were dilated and equal

**Thorax.**—There was better expansion of the right side of the chest than of the left Percussion note was normal throughout the right side although the liver seemed depressed There was dulness over the cardiac area Over the left lung there was a tympanitic hollow drum like note fremitus was absent Breath sounds were distant and breezy on both in and expiration The heart sounds were distant

**Abdomen.**—Soft but on percussion duller than normal no tenderness No movable dulness in the flanks Urine was freely voided and contained no blood There was a large normal movement shortly after admission

There was no injury to the spine nor could a broken rib be demonstrated The boy was conscious but very restless I saw him five hours after the accident when the restlessness was perhaps not so marked owing to his having had bromides

Examination of the chest at this time revealed the same physical signs as noted above except that the entire cardiac area was tympanitic apparently continuous with the stomach tympany below The heart sounds were very distant The pulse was still

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\*Read before the Philadelphia Academy of Surgery December 1907



rapid and irregular, the abdomen was dull and the note in the flanks not clear. It was feared that abdominal hemorrhage was taking place from injury to one of the solid viscera and the tympanitic note over the cardiac area, which seemed continuous with the stomach note, suggested a rupture of the diaphragm, with hernia of the stomach into the pleural cavity. Nausea was complained of but there was no vomiting.

The boy was etherized and an incision was made to the left of the median line in the epigastrium. The abdominal contents were found entirely normal. There was no rupture of the diaphragm and no hemorrhage. A slender needle was passed into the left pleural cavity and air withdrawn with a syringe. The diagnosis was then revised to rupture of the lung alone. The ether was well taken and both pulse and respiration improved under it.

At 7 P.M. the boy was resting quietly upon his back, the breathing much easier, though shallow, the pulse had improved and he complained of no pain. The following day it was noted that the heart dulness had moved to the right of the median line and the sounds were best heard at the xyphoid cartilage. There was apparently no increase in the pneumothorax, nor was any emphysema present. The patient was much more comfortable and respiration was less difficult. From then on convalescence was uneventful and the boy was discharged February 15th with the physical signs of a slight pneumothorax still persisting.

The patient was seen again November 26, 1907, when the only evidence of previous injury to the chest was a slight impairment of resonance over the lower border of the left lung, most noticeable in the axillary line.

In rupture of the lung the physical signs will depend, to a large extent, upon the degree and the situation of the injury produced in the lung. First The contusion may be so slight as to produce only a rupture of a few capillaries and vesicles, with extravasation of very minute quantities of blood through the lung tissue. The diagnosis of such a condition by physical signs would be impossible, and unless infection took place later, with the production of a broncho-pneumonia, it would pass unrecognized. Second There may be rupture of the lung sub-

stance without pleural injury. Then there would be no pneumothorax and if air entered the loose areolar tissue from a broken bronchiole it would dissect its way to the root of the lung, traverse the mediastinum and show itself at the root of the neck as a crepitant tumor. Third. In rupture of the lung with laceration of the visceral pleura, pneumothorax would probably be the immediate and prominent symptom. Fourth. When laceration is so extensive that a portion of the lung is almost severed from the rest, hemorrhage will be a prominent symptom in addition to the pneumothorax.

These various lesions of the lung may be produced in five different ways. 1. Bruising, where the force is not sufficient or not sufficiently concentrated to cause more than a slight subpleural ecchymosis.

2. Bursting, where the force is of such intensity that the lung cannot empty itself of air with sufficient rapidity. It has been likened to a paper bag inflated with air which receives a sharp blow. Whether it is necessary at the time of injury that the glottis should be closed to produce this result is a mooted point. Perhaps in some cases it is closed, for in times of sudden fear it is very common for an individual to take a short, quick inspiration and hold his breath. Yet it is easy to believe that if the force is sudden and violent the lung would not have time to empty itself of a sufficient amount of air even though the glottis were open.

3. Penetration from a green stick fracture of a rib, where after the force has expended itself the rib returns to its normal position. Such fractures frequently cannot be diagnosed either by palpation or by the X ray.

4. Compression of the lung against some more resistant tissue, as the pericardium, producing an injury resembling the wound of a dull, blunt instrument.

5. Tearing, where the lung has previously been glued to the chest wall by adhesions.

The condition of a lung in a cadaver and during life is so different that these injuries cannot be experimentally produced on the dead. In a dead body there is no rapidly circu-

lating blood, and the results of a traumatism in a lung full of blood and air would not be the same as in an empty one, the resistance to injury being different and perhaps lessened in the living lung

*Symptoms* —1 Shock Shock is always present, and its degree seems to be proportionate to the amount of injury in the lung, and to the temporary derangement of the nerves which control the heart action

2 Dyspnœa is always present and its degree will depend to a large extent upon the compression of the lung from the pneumothorax and to the derangement of the heart action The more rapidly the pneumothorax forms the greater will be the dyspnœa

3 The heart action will be interfered with owing to the traumatism of its nervous mechanism, the pneumothorax and the increasing resistance to the blood current from a collapsing lung The pulse is therefore rapid and often irregular, and the aeration of the blood having been interfered with there will be cyanosis of the skin

4 Cough will always be present, in part due to the compression of the lung, in part to the irritation of the injury itself It may be short and hacking, without expectoration, or there will be hæmoptysis when the extravasated blood finds its way into an open bronchus

5 The symptoms of pneumo- and hæmothorax will depend upon the lacerated visceral pleura communicating with an open air passage and upon the size of the vessels which are torn With pneumothorax there may be absence of heart dulness at first, followed later by displacement of the heart Hæmothorax will show movable dulness

6 Emphysema Emphysema may appear in two different localities If it appears first in the region of the injury it would be conclusive proof that there had been a fractured rib, for it would show a laceration of the parietal pleura as well as of the visceral, with the escape of air through this avenue to the subcutaneous tissues If it shows itself at the root of the neck as a crepitant tumor the air dissects its way in the

loose areolar tissue surrounding a bronchus into the mediastinum and from there to the neck. From either of these positions it may spread over the entire body producing an annoying complication.

*Diagnosis*—In the majority of cases the diagnosis of a ruptured lung is not difficult the physical signs present will clearly indicate the injury. There is one condition however in which an error in diagnosis may easily be made viz rupture of the diaphragm with displacement of the stomach or large intestine into the pleural cavity. In this condition there would be the same shock, dyspnoea and cyanosis with rapid heart action as would be present in rupture of the lung. The tympanic note of the hollow bowel could hardly be differentiated from a pneumothorax and metallic tinkling two coin test etc might also be present. There would probably be a dry hacking cough on account of compression of the lung. The tympanic note however should not extend to the apex of the pleura as the lung would be crowded upward and there should be breath sounds at the apex as well as over the root of the lung. Nausea and vomiting should be prominent symptoms in rupture of the diaphragm on account of the compression perhaps strangulation of the gut and as the case progressed these symptoms would become more and more marked. In rupture of the lung nausea and vomiting when present appear soon after the accident and do not continue after the stomach is emptied. In both rupture of the diaphragm and of the lung there may be displacement of the heart to the right side and in both in the beginning there may be entire absence of heart dulness.

The two main differences then would be the prominence of vomiting in rupture of the diaphragm and the fact that the tympanic note would not be universal over the pleural cavity. However if the lung is partially glued to the chest wall from a previous attack of pleurisy we may have breath sounds present over certain areas with vocal fremitus and resonance even when the lung has ruptured and a portion of the pleural cavity is filled with air.

I have never been able to place a just estimate upon the value of auscultatory percussion. In the case just reported this method of examination gave to my ear a tympanitic note continuous with that of the stomach, and I therefore made the error of diagnosing a rupture of the diaphragm. I have seen several acute observers make a similar error in diagnosing intestinal perforation where the abdomen was distended and tympanitic, relying upon the clear transmission of sound from a distance as proof positive of the presence of air in the peritoneal cavity.

*Treatment*—For the most part the treatment is symptomatic. Absolute rest in such position as is most comfortable to the patient, whether it be prone in bed or semi-recumbent, stimulation of the heart and sedatives for the nervous system. As a rule opium should not be given on account of its slowing effect upon the respiration. When respiration is very difficult from the pneumothorax pressure, aspiration of the pleura will usually give great relief and may be repeated from time to time. This should be done with a rather slender needle, as any amount of air may be drawn out through a small opening. If a needle of large calibre is used there will be danger of producing emphysema on its withdrawal. Strapping of the chest has been recommended for the control of the pneumothorax, but I cannot understand why it should do any good. It can only slightly decrease the capacity of the chest and it can in no way control or overcome the pressure exerted within the chest from the escaped air. The size of the pleural cavity is of no consequence, it is the pressure within which needs to be relieved. Strapping can do no good and it may impair the expansion of the uninjured lung.

If aspiration of the air from the pleural cavity is not giving the relief desired, for it will not be sufficient in cases where a fairly large bronchus has been opened, an incision between the ribs may be made or a portion of a rib excised and a drainage tube introduced. This will also permit the removal of blood from the pleural cavity and will tend to control the bleeding from the lung. Should the hemorrhage still persist

after opening the pleura a resection of one or more ribs will be necessary with ligation suture or packing of the bleeding area. When the blood which is retained in the pleural cavity becomes infected through an open bronchus the treatment will be the same as in ordinary empyema with drainage.

The three principal complications or sequelæ of this injury are broncho pneumonia empyema and gangrene or abscess of the lung. The mortality for this injury is somewhere in the neighborhood of 75 per cent.

# ACUTE DILATATION OF THE STOMACH AND ARTERIO-MESENTERIC ILEUS

BY WALTER B LAFFER, M.D.

OF CLEVELAND, OHIO

THIS syndrome has been given a variety of names, *e g* , Acute Dilatation of the Stomach, Arterio-Mesenteric Ileus, Gastro-Mesenteric Ileus, Mesenteric Intestinal Incarceration, Post-Operative Ileus, Post-Operative Arterio-Mesenteric Intestinal Obstruction, Post-Operative Acute Dilatation of the Stomach, Acute Duodeno-Jejunal Intestinal Obstruction, Post-Operative Gastric Paralysis, Combined Ileus, Duodenal Ileus and Duodenal Compression

It is but natural that a condition, or symptom complex, whose *modus operandi* and pathology are not definitely known, should have so many names

The literature of this syndrome dates back to 1842, for at this time Rokitansky<sup>39</sup> described a type of acute dilatation of the stomach due to compression of the duodenum by the root of the mesentery and its vessels and nerves. In the 3d edition of his book published in 1863, in speaking of Intestinal Incarceration due to pressure of one part of the intestine on it's mesentery on another, so as to compress it against the posterior abdominal wall, he says —

“Herewith belongs the compression of the lower transverse section of the duodenum by the mesentery of the small intestine and especially, by the superior mesenteric artery and nerves contained in the root of the mesentery”

He described a compression of the S-loop or last part of the ileum through the displacement downward of the small intestine, and he thought that this type of incarceration is favored by old age, and a long relaxed mesentery. He did not report any cases nor tell what occurred primarily to cause the mesentery to pinch the duodenum

In 1853 Miller and Humby<sup>157</sup> reported their case of acute

dilatation of the stomach Bamberger<sup>104</sup> as far back as 1855 called attention to the fact that serious infectious diseases are apt to produce acute gastric dilatation

Heschl<sup>187</sup> in 1855 described an ileus due to compression of both the last portions of the duodenum and the ileum against the vertebrae by the mesentery of the small intestine due to the pull exerted by the weight of the small intestine which had been previously displaced into the true pelvis

Brinton<sup>1</sup> in 1859 described acute dilatation of the stomach very precisely and endeavored to explain its pathology

Then followed the case of Erdmann<sup>7</sup> reported in 1868 where trauma was the cause and this patient recovered

Hilton Fagge<sup>17</sup> in 1872 gave us perhaps the first good description when he reported his cases

Glenard<sup>37</sup> in 1885 independently described mesenteric ileus and pointed out that the empty small intestine when prolapsed into the pelvis exerts a pull of 500 grammes on the root of the mesentery

In 1891 Kundrat reported three cases of mesenteric obstruction under the title — Concerning a Rare Form of Intestinal Incarceration

Then occurred the work of Schnitzler<sup>85</sup> which was in 1895 and which was soon followed by the very thorough resume and critical study of Albrecht<sup>1</sup> of all the previous literature and a report of two cases

Byron Robinson<sup>46</sup> of Chicago in 1900 independently discovered and described Arterio-Mesenteric Ileus

In France the condition was recognized by Duplay<sup>6</sup> Andral<sup>8</sup> Le Poil<sup>9</sup> Lechaudel<sup>10</sup> Thiebaut Bremont<sup>4</sup> and others

In 1902 H Campbell Thomson published his monograph containing 44 cases all that he was able to collect in the literature

To Neck<sup>23</sup> 163 Conner<sup>188</sup> and Braun & Seidel<sup>141</sup> we owe recent thorough reviews of the literature

This subject well illustrates the truth of the saying that



"We see only that for which we are looking," for it is surprising how rapidly the cases have increased in the literature since the publications of Albrecht<sup>1</sup> and Thomson<sup>2</sup>

Albrecht in 1899, found only nineteen cases, including his own, and Thomson but forty-four in 1902. Neck<sup>25</sup> in 1905 was able to find sixty cases, while Conner<sup>188</sup> reported 102 at the beginning of 1907

I have carefully gone over the American and Foreign literature of the subject and have collected 217 cases including my own

From my own clinical records I briefly report four cases

CASE I—Female, aged 25. Had been well during her pregnancy Had never had any stomach trouble Was delivered of her first baby after labor had lasted two hours, and during which a few drops of chloroform were given There was some hemorrhage after the birth before the placenta was delivered, but not enough to affect the pulse or color The placenta showed a single large cotyledon connected with the placenta proper by a long, thin piece of membrane I was unable to determine the presence of any more cotyledons that had been left behind, by inspection of the placenta.

The uterus contracted down well after the delivery of the placenta, and there was no bleeding All went well until an hour after the birth, when I found my patient with an extremely rapid, scarcely palpable pulse, but with no blanching She did not show any air-hunger and was conscious There was no visible bleeding The uterus was firmly contracted The upper abdomen was greatly distended I gave in succession hypodermics of ergot (for a possible concealed hemorrhage), adrenalin, ether, brandy and camphor I sent for Dr J J Thomas, an obstetrician, to aid me

The foot of the bed was elevated, and we gave salt-solution with adrenalin as a transfusion Dr Thomas, on seeing the abdomen, also immediately thought of acute dilatation of the stomach, just as I had done, but in the collapsed condition of our patient we feared to pass the stomach tube This was a mistake

The collapsed condition persisted for about eight hours, when

the pulse became stronger and the general condition better. Patient vomited often a small amount of green slimy fluid and belched considerable gas. For twenty four hours she vomited all fluid that was ingested. Abdomen still very distended but not so marked, not tender. The morning after the delivery it was reported that she had a restless night. Temperature was 99 pulse 108. Rectal tube left in the rectum had no effect on the distension. Lochia scant and dark in color and she passed a large clot of blood. At first she had to be catheterized but later voided urine normally. Later in the day she expelled gas from bowel after a high enema. Her temperature this evening was 100.2 pulse 116. She now showed beginning necrosis of the skin and subcutaneous tissue over the right hypochondrium where we had given the salt adrenalin transfusion. The second day following the day of delivery nurse reported that the patient had belched gas continually all night. Distension was much less. She retained milk and broth. Temperature A M 98.6 pulse 100 P M 101.2 pulse 120. A rectal tube brought away a large amount of gas. Lochia dark in color no odor. Uterus and abdomen not tender. Dr Cushing saw her with me this evening and thought as Dr Thomas and I had that the condition was one of acute dilatation of the stomach and that the slight rise in the temperature was due to the large slough that was forming at the place of transfusion. As her bowels had not moved well Dr Cushing advised that effort should be made to secure free movement which was done.

The next report showed a better night and that considerable gas had been expelled from the bowel. A M temperature 101.8 pulse 120 P M 103.6 pulse 132. Lochia dark in color with bad odor and a small clot was passed. No tenderness about uterus or over abdomen. Distension less. Slough over seat of transfusion loosening up and border inflamed. Bowels moved slightly twice and a great deal of flatus was passed. Distension of epigastrium nearly all gone.

The next morning a restless night was reported. Gas and stool expelled. A M temperature 101.4 pulse 120 P M 102.6 pulse 124. Later in the day bowels moved freely with a great deal of gas. Distension practically all gone. After a good night A M temperature 100.4 pulse 104 P M 101.8 pulse 112.

The next day A M temperature 100.2 pulse 112 P M 101.8

pulse 116 Milk abundant in breasts Abdomen not distended and not tender The bowels moved well The following day, A M temperature 99.4, pulse 108, P M temperature 101, pulse 104 Good stool and flatus passed Slough in side tender and inflamed

Next day, temperature A M 99.4, pulse 108, P M temperature 100.6, pulse 106 Bowels moved well Patient ate and felt well and laughed and joked Uterus seemed to be involuting well, but lochia was very dark and moderate in amount

The next day, nine days after the birth, the patient suddenly had a free hemorrhage from the uterus Both Dr Thomas and I were called, but when we got there the bleeding had stopped The patient's condition was good, pulse 120, little or no paleness A digital examination of the uterus disclosed another cotyledon, which was removed A hot sterile douche was given and the uterus contracted firmly with no more bleeding This was at 6 A M All went well until 12 noon, when the patient suddenly collapsed, *the abdomen became greatly distended*, there was no bleeding and no vomiting Pulse became more and more rapid and small, and finally, in spite of all restoratives and stimulants, the patient died at 1.30 P M

No autopsy was obtained, but an undertaker was immediately called to prepare her, and as the distension was so great that she could not be placed in a casket, a trocar was passed into the point of greatest distension, just below the left costal border, and a great quantity of gas and a quart of milky fluid, smelling strongly of Hoffman's anodyne that had been given her, was removed This showed that the trocar was in the stomach This one tapping removed all the abdominal distension

CASE II—Male, aged 17, schoolboy Family history good, with no bearing on the trouble When four years old he had scarlet fever, complicated by nasal diphtheria At this time had a left-sided purulent otitis media with an "abscess that broke behind the ear" Otitis discharged for a year When eight years old had otitis on the right side that discharged six weeks

Had nasal obstruction most of the time since he had scarlet fever and diphtheria Never had stomach trouble other than slight attacks of "biliousness" once in a long time and with which he seldom vomited His health lately was unusually good, and appetite and digestion normal

He was now suddenly seized with an antrum of Highmore infection on the right side as evidenced by a swelling over same by a temperature of from 103 to 104 pulse 80 to 90 and by a foul smelling discharge from the alveolar process which occurred three days later. As the general condition did not improve after the discharge began the opening near the first upper molar was enlarged and the antrum washed out and drained. His septic condition continued with chills fever of 99 to 103 and the pulse usually about 100.

Dr Ladd obtained from his blood and from an infusion in his left knee a pure culture of the staphylococcus pyogenes aureus.

He developed a dry pleurisy at the base of the left lung. His bowels and stomach during all this time showed nothing abnormal. After two weeks his infection seemed to have spent itself and his temperature came down to 100 pulse to 100 and he felt much better. He had been taking a large amount of milk and water the last few days.

I noticed one evening a slight distension of the epigastrum and the next morning it was very great reaching to below the navel and having a stomach like outline. His face was anxious with sunken facies. He had a restless night and had tried to vomit continually but could only raise a mouthful at a time of greenish fluid. His pulse had gone up to 120. He was very thirsty. Urine scanty but bowels had moved. Some dyspnea. Acute dilatation of the stomach was diagnosed. On passing the stomach tube just as the end of the tube entered the stomach a great quantity of gas whistled out as if under high pressure and was immediately followed by a jet of greenish black flocculent fluid that spurted three feet from the end of tube. About two quarts of this greenish black fluid were obtained. Lavage was practiced.

Patient felt greatly relieved and said I could pass tube any time as it gave him so much benefit. Abdomen was now flat. All feeding by mouth was stopped. Salt solution and nutrient enemata were given and strychnine hypodermically. Pulse came down from 120 to 100. Temperature 100. Bowels moved.

In spite of his taking no fluid by the mouth his distension and thirst was the most terrible and pitiful thing I have ever wit-

nessed, in spite of the salt-solution enemata and the saline transfusions that were given. He seemed to be literally dying from thirst, and would delight in dabbling his hands in the water used to keep the tube warm while giving the salt transfusion. Before each tubing his pulse would rise twenty to thirty beats and he would get restless. He became more and more collapsed, and died three days after the onset of the acute dilatation of the stomach, conscious to the last breath and begging for water to the end. No autopsy was obtained.

CASE III—Male, aged 38, electrical engineer. Never had stomach trouble. Was operated for me by Dr C A Hamann three days after onset of his first attack of appendicitis. Appendix was found ruptured and gangrenous. Free pus and cloudy fluid in abdomen. Abdomen was sponged, and a rubber tube and gauze were used as a drain. Urine not abnormal. He vomited a little after the ether.

The next day he was greatly distended, so that Traube's space was much enlarged and the area of liver dullness was almost gone. The epigastrium and the left upper abdomen were prominent. Vomited greenish fluid in small amounts, but kept trying to vomit without success. Felt very uneasy, restless, and facies were of the peritoneal type. A stomach tube was passed and a great quantity of gas and a small quantity of fluid removed. Distension disappeared and the patient felt much relieved. His pulse which was 120 dropped down after gastric lavage to 72. Flatus was passed together with a stool after a soap-suds enema. He had no more trouble on the part of the stomach and his recovery was uninterrupted.

CASE IV—This patient was seen with Dr Charles J Aldrich. Male, aged 36, school teacher, an old syphilitic. He had never been rugged, but never had before any severe illness. He has not had any stomach trouble.

About the middle of December, 1906, while working as a carpenter, and while overheated, he was seized with a sudden colicky pain in his stomach, which continued for about a week, and then disappeared. Later he had some buzzing in the head and nose bleed, and still later a sensation of numbness in his right leg as if it was asleep. A day or two after this he had pain in his knees. Soon he could not feel his urine pass, and then he became ataxic. Knee jerks were exaggerated, the right more than the left, being

almost a thigh clonus Double Babinski toe sign present Slight loss of sensation to pain touch and possibly to temperature to about the level of the first lumbar vertebra Cremasteric, gluteal and epigastric reflexes present Complained of a drawing sensation in back when he bent over and of a burning sensation in the thighs when the hand was rubbed over them

During the early part of February he had a slight rise of temperature from a cystitis and pyelitis resulting from catheterization or from a dorsal decubitus that had developed He had become completely paraplegic with incontinence of bowel and bladder

February 13th his pulse suddenly rose to 140 He began to vomit greenish fluid his abdomen was distended especially in epigastrium Traube's space was enlarged and the area of liver dullness destroyed He was in collapse He suddenly vomited about two quarts of greenish fluid but even afterwards showed marked distension Vomiting was repeated a number of times during the next twenty four hours Stomach tube was passed but in spite of the distension only a little fluid was obtained Probably it was not passed deep enough to reach the fluid as Neck<sup>113</sup> has pointed out

Patient died twenty four hours after the onset of the acute dilatation of the stomach

*Autopsy* showed stomach had been greatly distended but unfortunately an undertaker's assistant had run a knife into it to relieve the distension just before the autopsy However it was easy to be seen that it had been greatly dilated No dilatation of the duodenum was found No compression of the duodenum Small intestine not in the true pelvis

My first case was unusual in several respects I have been able to find in the literature but one other case where acute dilatation of the stomach complicated a confinement Thomson<sup>49</sup> described this case as due to a rupture of an ovarian abscess during delivery which set up a purulent peritonitis and an acute dilatation of the stomach Then too the suddenness of the onset in my case and the relapse a week afterwards are not common features

Kundrat<sup>83</sup> speaks of the conditions at the time of de

livery as being favorable for the occurrence of gastro-mesenteric ileus. This seems reasonable for the sudden lowering of the intra-abdominal pressure and the possible presence of adhesions between the mesentery or intestine and the contracting uterus causing a pull on the mesentery or a kink in the intestine, would favor it. Then too, it would seem easy for the contracting uterus to push the small intestine into the true pelvis and by its weight and bulk hold the intestine down, thus causing a pull on the mesentery. It is conceivable that one might, while using Credé's method of expressing the placenta, seize a loop of the intestine or a long mesentery in his grasp and thus exert a pull on the root of the mesentery or cause a kink in the intestine sufficient to obstruct its lumen and the lack of tone of the organs at this time would not favor nature in overcoming the hindrance.

My second case was quite classical, was recognized early and treated in the most approved manner. The terrible, agonizing thirst that could neither be relieved by saline transfusions, enemata, nor by drinking, made a lasting impression on my mind.

The post-operative case was mild and belonged to the frequent type, having a general infection, a peritonitis, an anesthetic, and an operation all as possible causative factors, often associated.

The case associated with a diffuse myelitis corresponds to the case reported by Kausch<sup>186</sup> and others. These cases occurring with demonstrable nerve lesions ably support the views advanced by Braun & Seidel<sup>141</sup> and others, that the primary cause is an innervation disturbance.

Many theories and explanations have been advanced as to the cause, etiology and *modus operandi* of this condition or symptom complex. This is but natural, for it is probable that we are dealing with a number of different types of acute dilatation of the stomach, due to a variety of causes and having a diverse, and as yet unknown pathology.

The mooted question is whether, in the gastro-mesenteric

ileus type the dilatation of the stomach is primary or secondary to the compression or kinking of the duodenum. The vast majority of the writers are in favor of a primary gastric dilatation and are supported in their views by the fact that at most autopsies no compression kink nor dilatation of the duodenum has been found. This may show that in the majority of the cases the gastric dilatation is primary and that the compression of the duodenum by the root of the mesentery is likely secondary and not necessary for the occurrence of acute dilatation of the stomach.

Albrecht<sup>1</sup> and Glenard<sup>2</sup> and others have pointed out that at the point where the duodenum is crossed by the root of the mesentery there is normally pressure enough to cause a slight hindrance to the onward flow of the contents of the duodenum so as to hold back the bile and pancreatic juice after a meal. This slight obstruction is normally overcome two and one half or three hours after a meal when the stomach pours out the chyme into the duodenum which stimulates the duodenum to contract and it overcomes the obstruction. With an atonic stomach we do not have sufficient chyme thrown out into the duodenum two or three hours after the meal to enable it to overcome this hindrance.

In the gastro-mesenteric ileus type of acute dilatation of the stomach I think there can be no question but that the kinking or compression of the duodenum due to the weight of the prolapsed small intestine pulling on the root of the mesentery and thus pinching the last part of the duodenum against the spine is a pronounced secondary factor in keeping up the dilatation. We do not know however in what order of rotation these different features make their appearance i.e. whether a nervous or muscular derangement of the stomach first occurs and causes the dilatation that pushes the intestine into the pelvis and by the weight of a full stomach on the last portion of the duodenum aided by the compression of the mesentery obstructs the lumen of the duodenum and thus keeps up the dilatation of the stomach or whether the first step is the prolapse of the small intestine



into the true pelvis, due to some unknown cause, which exerts a pull on the mesentery so its root compresses the last portion of the duodenum against the spine and thus causes a dilatation of the duodenum and the stomach

Chavannaz<sup>64</sup> thinks that the distention of the stomach to the symphysis would naturally prevent, by its weight and pressure, the passage of fecal matter along the bowels and thus cause more or less obstruction

Rokitansky,<sup>39</sup> who was the first to describe the gastro-mesenteric ileus type of acute dilatation of the stomach, thought that the sagging or prolapse of the intestine into the true pelvis exerted by its weight a sufficient pull on the mesentery to pinch the duodenum against the spine so as to close the lumen, and cause the duodenum and stomach to dilate

Albrecht<sup>1</sup> has ably championed this explanation and has reported nineteen cases which he found in the literature. He conducted some experiments on the cadaver and found that a two kilogram weight exerted enough pull on the mesentery to compress and close the duodenum and only a great intra-duodenal pressure of water was able to overcome the compression

Glénard<sup>37</sup> stated that the empty small intestine when prolapsed into the true pelvis caused a pull of about 500 grams on the mesentery, pinching the duodeno-jejunal border against the spine and that it was necessary for the duodenum in order to empty itself into the jejunum, to overcome this weight

Conner<sup>188</sup> experimented on ten cadavers, with the bodies in the dorsal position and the organs in place, the small intestine was removed and the mesentery gathered up into a mass and fastened to a cord which was passed into the pelvis and out through the anus and was allowed to hang free. Different weights were attached to this cord and the stomach and duodenum were then filled through the œsophagus, by a small tube of water from the tap, and the pressure necessary to overcome the duodenal obstruction estimated by connecting the tube with a mercury manometer. The results differed

greatly in different cases. In 3 instances the obstruction seemed to be due almost entirely to the weight of the distended stomach on the end of the duodenum and with this raised very little interference with the flow of the water into the jejunum was produced by a weight of 500 grams or even 1 kilogram attached to the mesentery. In each of these three cases a certain degree of gastropnoxis existed. In the other cases a load of 500 grams (the approximate weight of the empty small intestine) produced an obstruction to overcome which required a water pressure varying from 10 to 48 mm of mercury. In some of these cases the stomach gradually distended to a point where it lay upon the duodenum and by its weight increased somewhat the obstruction caused by the tense mesentery. In other instances the dilated stomach did not rest upon the duodenum and exerted no influence whatever upon the mesenteric obstruction. Conner concluded that in a certain proportion of normal individuals a pull upon the mesentery approximating in direction and force that which might be exerted by the empty small intestine hanging in the true pelvis can produce obstruction at the lower end of the duodenum which will require very considerable force to overcome.

The compression of the duodenum by the mesentery is thought to be favored by several special features as for instance Rokitsky<sup>39</sup> Muller<sup>33</sup> Kundrat<sup>83</sup> and Schnitzler<sup>85</sup> think that in order for the small intestine to prolapse into the true pelvis and thus exert this pull it is necessary for the mesentery to be unusually long or relaxed. Schnitzler<sup>85</sup> and others think a partially twisted mesentery or a mesentery of the partially closed fan shape instead of the open fan shape favors the localization of the pressure on a small section of the duodenum and thus more easily closes its lumen. Schnitzler<sup>85</sup> has shown on the cadaver that when the root of the mesentery is inserted to the right of the median line it is more easy for a pull on it to compress the duodenum than when it is inserted to the left.

Muller<sup>33</sup> found it very difficult in fat individuals to

produce much compression on the duodenum by pulling on the mesentery, but after the fat was removed from about the root of the mesentery it was possible to compress the duodenum in these cases. Hence emaciation is considered to favor the occurrence of gastric-mesenteric ileus.

The prolapse of the small intestine into the true pelvis thus causing a pull on the mesentery. Conner<sup>188</sup> says is the *sine qua non* to the production of such mesenteric occlusion of the duodenum. This view is supported by Rokitansky,<sup>39</sup> Albrecht,<sup>1</sup> Glénard,<sup>37</sup> Kundrat,<sup>83</sup> Schnitzler,<sup>85</sup> Muller,<sup>33</sup> Meyer,<sup>75</sup> Riedel,<sup>185</sup> Schulz,<sup>88</sup> Kausch,<sup>186</sup> Robinson<sup>46</sup> and others.

While most writers have failed to state why the small intestine prolapsed into the pelvis, yet some, especially Byron Robinson,<sup>46</sup> have thought that there was in these cases ptosis of the abdominal viscera with relaxation of the abdominal walls. Robinson<sup>46</sup> has studied several hundred autopsies with this point in mind and found fifteen or twenty cases which showed distinct and extensive gastro-intestinal dilatation which began in the duodenum on the right side of the superior mesenteric artery and vein. He believes that gastroduodenal dilatation is the direct cause of many deaths of patients with visceral ptosis after they have passed forty years of age. He says further that duodenal obstruction arises in the anatomic fact that, (a) the transverse duodenal segment in the cases of visceral ptosis does not travel distalward as rapidly as does the enteron. (b) In adult man the duodenum possesses a mesenteric membrana propria only. It does not possess a peritoneal mesentery, which fact alone explains why the duodenum does not move distalward as rapidly as the enteron, as the latter possess a long mesentery.

In order to enter the true pelvis the small intestine must be empty even of gas and Muller<sup>33</sup> and others have spoken of the purgation and fasting previous to operations, as emptying the intestine and thus allowing it to prolapse into the true pelvis.

Lichtenstein<sup>161</sup> puts forth the theory that we may be

able to explain the arterio-mesenteric ileus by an abnormal congenital attachment of the mesocolon to the peritoneum of the duodenum and to the posterior parietal peritoneum. Under or behind this line of attachment of the mesocolon the last part of the duodenum passes to merge into the jejunum. He thinks it conceivable that certain variation from the normal structure at this point would render this individual disposed to this form of ileus by any distension of his stomach.

Glenard<sup>3</sup> says that while the mesentery always normally slightly constricts the lumen of the duodenum yet in some cases as Rokitsansky<sup>39</sup> and Muller<sup>33</sup> have pointed out the mesentery is so long that even when the small intestine prolapses into the true pelvis no pull is exerted on the mesentery.

Against the theory that the compression of the root of the mesentery on the duodenum is the primary cause of the so-called arterio-mesenteric type of acute dilatation of the stomach we have the following evidence—First living bodies must act different than the toneless dead bodies with out innervation that were experimented on by Albrecht Conner Kelling Gubaroff and others so that their experimental evidence is of doubtful value.

We know too as Hanau and others have pointed out that the small intestine is often found in the true pelvis at autopsy yet gastro-mesenteric ileus is rare.

Kelling<sup>108</sup> thinks it striking that the small intestine when found incarcerated in the pelvis in no instance showed œdema cyanosis or any circulatory disturbance.

Seeling<sup>140</sup> thinks that Zade<sup>116</sup> is correct in believing that gastro-mesenteric ileus is never caused by the mere gravitation of the small intestine into the pelvis if all other intra abdominal conditions are normal.

Rieder<sup>66</sup> has shown by giving normal individuals bismuth and then examining them by means of the X ray that the jejunum and ileum occupy the middle region of the abdomen usually but often a part of the true pelvis. The last

portion of the ileum especially is frequently found in the true pelvis normally

Braun & Seidel<sup>141</sup> have called attention to how rarely acute dilatation of the stomach of a slight degree or in its early stage is seen, which is not the case in other forms of mechanical intestinal closure. They also speak of the rarity of changes being found in the intestinal wall at the point where the mesentery compresses the duodenum. Baumler's<sup>99</sup> case being the only one to show any change in the intestinal wall. They also point out the absence of ascites or peritoneal exudation as found in other forms of intestinal closure lasting a number of days.

While in the cases of Meyer,<sup>75</sup> Riedel,<sup>185</sup> Schulz,<sup>88</sup> Kausch<sup>186</sup> (2 cases), and a number of others, the small intestines were in the true pelvis, the last part of the duodenum was not found dilated, and in the cases of Hood, Kirch,<sup>180</sup> and Thomson<sup>2, 49</sup> the distension of the small intestine extended past the duodeno-jejunal boundary. In Thomson's<sup>49</sup> case the dilatation extended throughout eight feet of the small intestine and then passed abruptly into collapsed bowel, without any constricting force or obstruction being demonstrable.

In only 27 cases in the 120 autopsied cases in the 217 cases of acute dilatation of the stomach reported in the literature was the dilatation found to be of the gastro-mesenteric ileus type.

Therefore as there has not been a compression of the duodenum nor a dilatation of the duodenum found in the majority of cases autopsied, we cannot accept the view that the mesenteric compression is the usual cause of acute dilatation of the stomach. With the vast majority of cases being evidently due to some other cause, and with no satisfactory explanation of why the small intestine prolapses into the pelvis and when prolapse sometimes does and sometimes does not cause the mesentery to constrict the duodenum, we cannot believe that when mesenteric compression is present that it has been the first cause of the gastro-duodenal dilatation. It seems more

likely that a primary gastric dilatation of nervous origin pushes the small intestine into the pelvis and holds it there thus sometimes causing a sufficient pull on the mesentery to compress the duodenum. The weight of the full stomach resting on the duodenum in some cases aids in obstructing its lumen as Conner<sup>188</sup> has shown.

Kelling<sup>108</sup> offered the following explanation supported by clinical observations and experiments on the cadaver and on dogs. He thinks it necessary to first assume that both openings of the stomach must be obstructed in order for acute dilatation of the stomach to occur for if one is patulous the stomach will empty itself through that opening before marked dilatation can occur. He therefore directed his attention not only to the pylorus and duodenum but also to the cardia and œsophagus. He found that when he inflated the stomach of certain cadavers through a canula in the anterior stomach wall that the cardia was closed by a valve like fold of the mucosa. This valve like action being aided in closing the œsophageal opening by the distended fundus pressing on the œsophagus from the side. The degree of resistance of this valve like fold of mucosa to the intra gastric pressure varied greatly according to its development. In cases where practically no fold of the mucosa was found the stomach easily emptied itself but when the fold was well developed it resisted a pressure sufficient to burst the stomach. Gubaroff<sup>109</sup> has also pointed out this valve-like fold. Kelling thinks that there are people that cannot vomit owing to the marked development of this fold.

Kelling showed on dogs that with a canula in the anterior wall of the stomach that it was impossible to produce in the state of consciousness of normal dogs any great dilatation for the stomach emptied itself when the pressure reached about 25 cm of water through the vomiting or eruction reflex being set up. But if you narcotized the dog or cut both vagi you could distend the stomach until it burst. He thinks this is due to the fact that while normally the cardia is opened by the action of the figure of 8 like fibres of the

diaphragm muscle, which enclose the œsophagus and are inserted into it, the activity of this opening apparatus of the cardia is destroyed or inhibited by an anesthetic or by cutting both vagi

Kelling claims that on the cadaver he was able to show that with certain individuals the simple overfilling of the stomach produces a spontaneous closure of the cardiac opening and a kink of the duodenum. The kink of the duodenum being favored by anatomical conditions or by adhesions, and it may occur at any point in the duodenum, above or below the papilla of Vater

He thinks that the narcosis is the chief factor in producing the acute dilatation in surgical cases, but here we must have the anatomical conditions of cardia and duodenum favorable before the narcosis can produce this effect on the muscular tone of the stomach and the cardiac opening apparatus. Then too the stomach must be overfilled, preferably by food that is highly fermentable and which if retained will form quickly a great amount of gas and thus rapidly distend the stomach

Others have repeated the experiments of Kelling with more or less different results. Von Mikulicz<sup>174</sup> found the resistance of the cardia to intra-gastric distension too variable to make possible any deductions from his experiments. Conner<sup>188</sup> inflated the stomachs of 12 cadavers and found that in 7 instances very considerable distension of the stomach occurred before there was any leakage of air through the œsophagus, but such leakage always took place when the air reached a certain height, which, measured by a water manometer, varied between 15 and 26 cm. In the other five cases air passed freely into the œsophagus and no distension of the stomach could be produced

Conner's results in the matter of duodenal obstruction were also somewhat at variance with those of Kelling. He found with the œsophagus ligated and the stomach inflated, obstructive duodenal kinks were seen in only three cases, and in each of these air passed the obstruction when the in-

tragastric pressure measured 22 cm or less by the water manometer. In each instance the kink formed at the junction of the superior with the descending limb. In one of these instances the air after passing the kink at 20 cm. pressure found further obstruction at the point of crossing of the root of the mesentery. In four other instances obstruction occurred not in the duodenum but at the pylorus which was tightly closed and required a pressure of from 15 to 25 cm to overcome it.

Reichel<sup>10</sup> believes he has shown by experiment that artificial kinking of the intestine is not enough in itself to produce a complete occlusion but there must be in addition a peritonitis at this loop of the intestine.

Braun and Seidel<sup>11</sup> experimented on 19 cadavers by distending the stomach through a gastric fistula and showed that there was frequently a half moon shaped fold of mucosa on the left side of the œsophageal insertion but they could not show that it had a valve like action for in two of their cases where the greatest tension was resisted the fold was absent or just barely feelable. They found that the fundus was greatly developed in these cases and when it was distended it forced the diaphragm upward. When one pressed down on the fundus by inserting the hand between it and the diaphragm the air escaped into the œsophagus. Pressure on the stomach in imitation of the action of the abdominal walls did not cause the air to escape into the œsophagus. They agree with Kelling and Gubaroff that the kinking of the œsophagus and the way the stomach is fixed to the diaphragm favors the firm closure of the cardiac orifice.

Braun and Seidel<sup>11</sup> think that in addition we have a very important factor in the greatly developed high reaching fundus which favors the kinking of the œsophagus and probably also compresses the œsophagus from the side. They found it necessary in order to get distension of the fundus that there be a certain amount of closure of the cardia and that the stomach walls were not supported by touching the other organs or the abdominal walls. They think the reason



that Kelling got a resistance of the cardiac orifice to pressure so often was that his experiments were conducted with the abdomen open. Braun and Seidel found that the same cases that allowed the gas to escape through the cardia with the abdomen closed did not allow it to escape when the abdomen or chest were opened. The open abdomen favors kinking of the œsophagus and removes the support of the belly walls and organs from the stomach.

Braun and Seidel<sup>141</sup> point out that Sauerbruch and Haecker have determined by experiment that the cardia is not closed by a sphincter. Sinnhuber has inserted his finger in the cardia of living patients and has felt an inspiratory constriction and Braun and Seidel agree with him in thinking that in the living there is a tonic contraction of the cardiac orifice and the closure is made more forcible by the diaphragm muscle fibres encircling the œsophagus, and also by the œsophagus not being inserted into the stomach at its highest point so that the distension of the fundus enables it to press on the œsophagus from the side and close the œsophagus.

Braun and Seidel<sup>141</sup> only once were able, during their inflation experiments, to observe a kinking or closure of the duodeno-jejunal border and then the empty small intestine lay in the true pelvis. They think this result as well as the results that Kelling obtained were due to the abdomen being open and the organs not in the same position and condition as with the closed abdomen. They think it unwise to compare these conditions, with the absence of peristalsis and the lack of gastric and duodenal muscular tone, to the conditions in the living body.

Braun and Seidel experimented on twenty dogs with the hope of throwing light on the question. They first made a Witzel gastric fistula in each dog and allowed the animal to fully recover from the operation before they did their experimental work. They found, as Kelling had, that the conscious dogs after inflation of the stomach, promptly emptied the organ by ructus and vomiting, but when the

dogs were deeply narcotized the gas did not escape even with the pressure increased to the point of rupture of the abdomen. The distension being so great as to cause the breathing to be shallow or to have stopped and the pulse small and irregular. On awakening these dogs promptly expelled the gas by belching or vomiting.

They cut the vagi in some dogs and cocaineized them in others and found that these animals were unable to empty their stomachs after tartar emetic was given but vomited promptly after apomorphine (a centrally acting emetic) was given. They found that cutting the splanchnics had an inhibiting influence on the vomiting even after apomorphine was given but this inhibition passed off in a few days. Cutting the sympathetics seemed to have no effect on the vomiting reflex.

Section of the spinal cord between the last cervical and the sixth dorsal prevented vomiting even after apomorphine was injected. This showed the importance of the gastric innervation fibres passing through the cord above the sixth dorsal vertebra on the gastric motor apparatus. The absence of vomiting after section of the cord above the sixth dorsal was not due to shock for section of the cord below this point did not prevent vomiting.

They were able to show by section of the innervation paths that the abdominal walls are not necessary to the vomiting act.

They concluded that the vagi are the most important of the gastric centripetal nerve paths from the stomach to the centers in the cord and brain and that a certain motor and secretory paralysis occurs after cutting these nerves.

From a study of their clinical cases and the above described experimental work on the cadaver and on dogs Bruhn and Seidel conclude that acute dilatation can best be explained on the ground of a primary central or peripheral disturbance of the gastric innervation apparatus. In their cases they think that the anemia or narcosis or both caused a disturbance of the vomiting reflex so that the stomach did not

fully relieve itself, but allowed over-distension to occur, and reminded them of the dogs with the vagi cut, where the vomiting centers were late (or were not stimulated) to act over other paths. With these dogs they got slight vomiting, only after a colossal distension of the stomach.

They think their cases cannot be explained by a mechanical hindrance such as a compression of the mesentery nor by a muscular insufficiency, but are to be explained rather by an innervation disturbance due to the narcosis and the operative procedure. Probably the ether or chloroform paralyzed the vomiting centers as in the case of the dogs.

While the vomiting centers are paralyzed in man during the narcosis, we have on awakening, an excitable condition of the centers, as shown by the post-anesthetic vomiting. After this hyperexcitability of the centers has continued a variable period the centers become normal in most cases, but in others it is followed by a condition of lessened excitability, or exhaustion, or even of paralysis. It is when this last condition occurs that we have acute dilatation of the stomach produced.

This explains the cases of Morris,<sup>180</sup> Robb,<sup>55</sup> and Riedel<sup>185</sup> where the anesthetic seemed to be the only thing that could have caused the dilatation. Where an anesthetic and an operation are associated it is difficult to tell which is to blame.

Braun<sup>141</sup> thinks his cases 1 and 4 were due to a reflex nerve disturbance. Von Herff<sup>190</sup> blames an innervation disturbance for his case which occurred after a hysterectomy. Grundzach<sup>41</sup> and Kampmann thought that innervation disturbance caused their cases.

The cases of Kelling,<sup>108</sup> Perry and Shaw<sup>86</sup> (Buzzard)<sup>151</sup> Kirch<sup>180</sup> and Kausch<sup>186</sup> where acute dilatation of the stomach followed the application of a plaster jacket (often after a hearty meal) may have been due to an interference with the stomach or intestinal motility, but even here, as the cases occurred after extension and straightening of the spine, with fixation of the vertebral column in a strained

position we might consider with great probability that there had occurred a slight injury to the cord or at least to the gastric spinal nerve roots

In the cases associated with either local or general peritonitis the gastro duodenal dilatation is probably due to an innervation disturbance either through the local effect of the inflammation on the gastro intestinal nerves or to the general effect exerted on the centers and nerves by the toxemia of the infection which may cause a paralysis of the entire gastro-intestinal tract

Riedel<sup>3</sup> thinks there is often a serous infiltration of the walls of the stomach which lessens the peristaltic waves especially after gall stone operations and this causes a primary weakness of the stomach walls which leads to a fluid accumulation in the stomach Halsted<sup>101</sup> reports a case operated on for gall stones where an ileus of the first portion of the duodenum and the pyloric end of the stomach was found and accurately corresponding to this distended portion of the bowel was a slight peritonitis scarcely more than an injection of the serosa with only enough exudate to cause very slight adhesions between the duodenum and gall bladder and the vascular injection was accurately limited to the dilated portion Kelling<sup>108</sup> thinks peritonitis may interfere with the action of the longitudinal muscle band controlling the cardia

Braun and Seidel<sup>141</sup> think the cases of *circulus vitiosus* seen following a gastrostomy gastroenterostomy resection pyloroplasty etc. are due to an acute or to an acceleration of a chronic more or less severe grade of motor insufficiency and due to a direct or reflex injury of the stomach motility In these cases there may be absence of vomiting and belching although the stomach is over filled with stinking material which can only be explained by a disturbance of the reflex apparatus

Openchowski has decided that there are a number of centers in the brain and upper cord controlling gastric movements From these centers both contraction and dilatation

fibres pass either by the vagi or by the spinal cord. Those passing by way of the cord leave the cord between the fifth and eighth dorsal vertebra and reach the stomach by way of the splanchnics. He says that less important nerve fibres go from above the 2d dorsal ganglion by way of the sympathetic to the cardia. The automatic ganglion of the stomach is connected with the termination of these nerves.

Legueu<sup>169</sup> and Reynier<sup>170</sup> believe that acute dilatation of the stomach, often seen after operation on the kidney, is due to injury or irritation of the solar plexus nerve branches and liken it to the paralysis of the bladder produced by dilatation of the anus where we have the irritation or injury of the filaments of the hypogastric plexus.

Other evidence in favor of the view that acute dilatation of the stomach is due to an innervation disturbance is that Carion and Hallion<sup>191</sup> have shown that section of the pneumogastric nerves in dogs leads to dilatation of the stomach and to symptoms in many cases resembling those of uremia, probably due to the absorption of toxins from the stomach as in gastric tetany. Pavy<sup>62</sup> has shown that cutting both vagi in dogs may cause a paralysis and dilatation of the œsophagus as well as of the stomach.

Stieda's<sup>111</sup> experimental work on dogs is of special interest for he showed that section of both vagi of an animal two months after a gastroenterostomy posterior had been performed led to acute dilatation of the stomach with retention of dark brown or greenish fluid, even though the gastroenterostomy opening was large enough to admit the little finger.

Some light is thrown on this subject by the interesting series of experiments conducted by Cannon and Murphy<sup>192</sup>. They showed by the X-Ray-Bismuth method of examination that after handling the stomach and intestines even gently and within the peritoneal cavity, or under warm salt-solution, no gastric peristalsis was seen and no food left the stomach for three hours. Fingering the stomach and intestines gently in the air caused a still greater retardation of the move-

ments of food and with rough handling in the air no food passed the stomach for four hours and then slowly and it was moved downward sluggishly by the intestine

The belief that acute dilatation of the stomach is due to an innervation disturbance dates at least as far back as 1862 when Brinton<sup>17</sup> clearly explained this gastric nerve disturbance in two cases of typhoid which disease caused injury of the sympathetic and cerebro-spinal centers :c the solar plexus and the pneumogastric were exhausted

I believe that the clinical pathological and experimental data are strongly in favor of acute dilatation of the stomach as being primarily an innervation disturbance affecting either the centers in the brain or cord or the nerve paths connecting the stomach with these centers

Traube believed a gastric ulcer could produce the condition by affecting the nerve end organs

In support of this explanation I am able to name not less than twenty seven writers on this subject including those who have given the matter the most consideration and who have done the best experimental work

Many other causes some quite theoretical have been given for the occurrence of acute dilatation of the stomach

In favor of a simple primary or essential weakness of the stomach we have the names of Andral Stieda Lietaud Majendie Duplay Hanau Skoda Rosenback Poensgen and von Herff

While Kussmaul<sup>18</sup> showed fatty and colloid degeneration of the muscle fibres in cases of chronic dilatation this change has not been found in acute dilatation of the stomach but instead chiefly the separation of fibres due to the stretching and thinning

Kussmaul<sup>18</sup> called attention to the possibility of a chronically dilated stomach causing by its weight pressing on the horizontal limb a complete closure of the duodenum and a superimposed acute dilatation He also thought that a chronic dilatation may reach a point where the pull on the more fixed part of the pylorus might cause a kink of

the pylorus and an acute dilatation of the stomach results. He has shown by over-loading the stomach of a cadaver that there is a displacement of the stomach downward and a kinking of the duodenum at the point where the slightly fixed horizontal part joins the firmly fixed vertical part. The injection of a great quantity of fluid into the stomach caused kinking at this point followed by great dilatation of the stomach and of the duodenum above this obstruction. If more fluid was injected a bursting of the duodenum, not of the stomach, occurred. He thinks that the vomiting following the over-loading of some stomachs is likely due to a closure of the duodenum, which is again rendered patulous by the vomiting and reverse peristalsis.

Boas<sup>94</sup> thinks that even an acute dyspepsia can cause an acute dilatation of the stomach and likens it to Frantzel's "Acute Ueberanstrengung des Herzens," and suggests the name "Acute Ueberanstrengung des Magens."

Stieda<sup>31</sup> believes the primary cause of the dilatation is an acute increasing atony of the stomach and of the duodenum.

Albrecht<sup>1</sup> thought an acute dilation of the stomach might be engrafted on a chronically dilated stomach that suddenly lacked sufficient muscle tone to overcome the obstruction and that the dilated cecum and ascending colon occasionally found are due to kinks made by the dilated stomach pushing down the transverse colon.

Kelling<sup>108</sup> says there must be a primary over-distension of the stomach which compresses the small intestine into the pelvis and calls the condition "combination ileus."

Whatever the etiology, the primary trouble is not the dilatation, but the motor insufficiency, which leads to the dilatation from the accumulation of gas due to fermentation and the retention of the ingested food and drink, together with the over-secretion.

Morris<sup>180</sup> thought the chief cause of the trouble was a hypersecretion of the gastric juice which is almost always

present Mahommeds<sup>179</sup> and Borchards<sup>164</sup> cases also emphasize this point

Kelling<sup>108</sup> mentions forcible compression of the abdominal walls by vomiting or even by laughing (Schmorl's<sup>110</sup> case) as tending to displace the intestines downward and thus cause a kinking of the intestine or a compression of the duodenum by the root of the mesentery

Spinal deformity or the application of a plaster jacket to correct such a deformity has been blamed for the occurrence of acute dilatation of the stomach in an interesting group of cases reported by Buzzard<sup>151</sup> Kausch<sup>168</sup> Kelling<sup>108</sup> and Willet<sup>1</sup> and others The deformity present was a dorsal kyphosis due to Pott's disease in three cases Other cases showed either a lumbar lordosis a uniform kyphotic curve of the dorso-lumbar spine a dorso-lumbar scoliosis or a rachitis dorsal kyphoscoliosis An important practical feature of these cases is that five developed the acute gastric dilatation soon after being incased in a plaster jacket

Schnitzler<sup>8</sup> thinks the increased prominence of the lumbar vertebræ in lordosis must facilitate the compression of the duodenum against the spine by the mesentery Kelling<sup>108</sup> thinks that spinal curvature favors acute dilatation of the stomach by causing a more vertical position of the stomach and a displacement downward of the pylorus which constrained position may be such as to immobilize the stomach Kussmaul<sup>70</sup> says that the vertical position of the stomach which is more frequent in women may be either a remains of the fetal position or acquired from pressure of a corset or bands about the waist or displaced by a large liver The pylorus may thus be displaced to the left and downward to or below the navel in a stomach of normal dimensions and this position necessarily favors dilatation

Ptois of the abdominal viscera with relaxation of the belly walls has been considered a causative factor by many (Glenard<sup>37</sup> Robinson<sup>46</sup> and others) They think that the low position of the stomach favors dilatation and a pyloric kinking and the relaxed belly wall cause a collapse of



the intestine into the true pelvis and may cause kinking of the duodenum or a mesenteric compression Bartels is supported by Bettman,<sup>145</sup> and others, in thinking that a floating right kidney may press on the duodenum and cause an obstruction of its lumen sufficient to produce an ileus

It is possible as some have thought that a contraction or spasm of the duodenal sphincter fibres as described by Ochsner<sup>156</sup> may be the precipitating cause of the dilatation It is not uncommon at operation on the gall bladder to find the duodenum dilated with or without a gastric dilatation Davis<sup>65</sup> has shown by the X-Ray-Bismuth method of examination that the duodenum in normal individuals may be markedly dilated perhaps due to the contraction of these fibres

Muller<sup>33</sup> thinks the dorsal decubitus position before, during, and after operation, is the most important contributing cause of acute dilatation, as he thinks it favors the prolapse of the small intestine into the true pelvis He thinks the purgation before the operation is a factor, for by emptying the bowels it is more easy for them to enter the pelvis It is hard to see how a dorsal position would favor the prolapse of the intestine more than the upright or standing position, or why, if it was much of a factor, it does not set up the trouble more often

Volvulus or rotation of the stomach seemed to have been a causative factor in the cases of Thomson<sup>1</sup> and Wiesinger<sup>176</sup>

Fermentation of the gastric contents may be a cause, for it not only follows gastric stasis, but as Naunyn<sup>175</sup> has shown, may in itself cause a gastric motor insufficiency Ehret<sup>175</sup> has experimented on himself by eating highly fermentable substances and thus produced a *circulus vitiosus*, *i e*, fermentation, gastric stasis, motor insufficiency and more fermentation

The filling of the bursa omentalis by a pancreatic cyst or an abscess may cause an acute gastric dilatation A large gallstone may act as an obturator in the duodenum and cause the dilatation

(To be continued)

# UNILATERAL RENAL HEMATURIA DUE TO PYELITIS CYSTICA \*

BY IRVING S HAYNES M D

OF NEW YORK

Surgeon in Chief H. P. I.

UNILATERAL renal hematuria may be due to many causes—as calculus tuberculosis new growths etc.—which are demonstrable before or at an operation less often to some obscure condition not ascertained even during an operation and in a few instances the cause has not been found after the extirpated kidney has been subjected to careful microscopical examination

Such instances of bleeding from apparently normal kidneys have been termed idiopathic or essential hematuria. These cases however on microscopical examination usually show some pathological condition sufficient to explain the hæmorrhage. The lesions most frequently present in this class of cases is one of isolated patches of chronic nephritis

But in the absence of microscopic changes it is not safe to attribute to this cause all such cases of obscure bleeding. The following case which I wish to report furnishes some pathological changes not usually found in the so-called instances of essential hematuria

History of patient taken March 7 1905 J W age 65 American retired builder Large strong man apparently about 50 years of age weighs 185 pounds Has never used alcoholic beverages smokes a little

*Family History*—Father died at 78 mother at 32 in child birth No bleeders or cases of Bright's disease cancers tumors or stones in the bladder in family

*Previous History*—Forty four years ago he had an attack of malaria and jaundice while with the army at Nashville Tenn

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\* Read at a meeting of the New York Surgical Society December

He was very yellow at this time, but had no attacks of pain. His skin did not clear up entirely for two years, and the effects of this attack lasted for several years. There were no symptoms, however, referable to the genito-urinary system.

Twenty years ago he had an attack of rheumatic sciatica. His general health has been excellent. He never has had any venereal diseases, in fact never had sexual intercourse until his marriage, when fifty years of age, to a strong healthy woman half his age. He has been very vigorous in his marital relations, and has three healthy children.

*Present History Urination*—In 1897 he began to notice that he had to pass his urine more frequently than usual. These attacks of increased frequency of urination at first lasted only a few hours, and would then pass off. They would return under stress of extra exertion, worry in business, excitement and loss of sleep. He began to get up to urinate during the night. Gradually the act of urination became painful, the pain seeming to run from the kidneys and the head of the penis to centre in the bladder. At present he urinates every hour or two if at rest, and not excited or worried, but every five to ten minutes if under mental strain.

At night he gets up from six to eight times, sometimes more. When under any nervous tension, he has a great deal of straining during urination with severe pain in the head of the penis. Cold sweat runs down his back. The urine comes in a gush in a good sized stream. He says it has never stopped suddenly.

*Pain*—He feels at times pain in the small of the back—"like boring with an auger"—more on the left side, but it may extend over to the right side. The pain goes away on lying down. The pain shoots down into his scrotum and to the head of the penis, especially just before urinating, and is so severe that he has to squeeze his penis as hard as he can to ease it.

*Blood in the Urine*—In the summer of 1903, after being forced to hold his water for a long time, he first passed bloody urine. This attack lasted twenty-four hours, when the urine cleared up after resting at home. Twice since then he has noticed two or three "strings of blood the size of a pin and one-half inch long" in the urine. Last summer, 1904, there was a small blood clot in the chamber. Bowels are quite regular.

His digestion is slow. Tongue is slightly coated at times. He has some soreness beneath the costal arch on the right side at times.

*Physical Examination*—Temperature normal pulse 84 arteries soft. The heart and lungs are normal. The liver is not enlarged. There is no trouble with the gall bladder or ducts. The stomach is normal. The spleen is not enlarged. The intestines are not distended nor sensitive and there is no evidence of appendicitis. Neither kidney is sensitive or palpable. There is no tenderness over the course of the ureters nor over the bladder. The external genital organs are normal. There is no stricture in the urethra. Residual urine measures one ounce it is a little cloudy but not bloody or ammoniacal. Specific gravity above normal. Trace of albumen.

*Rectal Examination*—This shows only a good sized prostate normal in feel and not tender.

In one month under urotropin alternating with a mixture of hyoscine and infusions of buchu the urine became clear there was no residual urine left in the bladder and his general condition improved so much that he did not report for several months or until January 1906 when he stated then that during August 1905 one morning after passing a quantity of clear urine there followed about an ounce of bright blood. After this he passed bloody urine for a few days. An urinalysis made February 7 1906 shows the following:

Odor urinous color yellow spec gravity 1.05 reaction moderately acid appearance cloudy sediment small amount quantity passed in 24 hours 52 ounces.

*Chemical Analysis*—Albumen large amount sugar small amount urea 9 gr per oz bile none acetone none indican none chlorides normal phosphates normal.

*Microscopical Examination*—Epithelium few round crystals none amorphous deposits none blood large number corpuscles pus large number leucocytes casts hyaline mucin large number corpuscles fungi none spermatozoa none bacteria none.

The irritation in the penis and soreness over the back is less and his general health is better than one year ago.

I had several X-ray photographs made by Dr L. C. Cole of which the outline are here given. Fig. 1 the right kidney

Fig 2, the left kidney, Fig 3, the pelvic cavity All viewed from behind

The photograph of the left kidney shows that it is considerably enlarged In the pelvis (photograph No 3) in a region apparently close to the bladder, and in the course of the left ureter is a small dark round shadow A tentative diagnosis of ureteral calculus was then apparently justified

On March 9, 1906, Dr Follen Cabot cystoscoped the patient for me, methylene blue having been previously given Examination of the bladder showed that it was normal in all parts except about the left ureteral orifice Here the mucous membrane was somewhat thickened and reddened

A catheter was readily entered in the right ureter and passed to the pelvis The orifice of the left ureter was entered after some difficulty owing to a ridge in front of it, and the catheter passed easily and without obstruction to the pelvis of the kidney This demonstrated that there was no calculus in the ureter The shadow in the photograph might have been cast by a calcareous lymphatic gland, a phlebolith, or some object in the rectum

Examination of the urine from the left kidney was made by Dr T W Hastings, who reported as follows

Urine, blue, after methylene blue, faintly cloudy, few fine flakes Albumen, a trace

Microscopic Many large cells, single and in masses, few leucocytes, many blood cells, few squamous cells from genito-urinary tract Stained after hardening *Cells in masses show structure, suggesting neoplasm, particularly papillomatous tissue*

At this date, as the patient was indisposed to have any operative work done—as the evidences of a papillomatous growth in the kidney was very inconclusive, as his general health was good and his urinary symptoms not urgent, and he was enjoying a fair degree of comfort from internal medication, I did not urge operative treatment He reported once or twice a month for observation

On November 5, 1906, an urinary analysis by Dr Hastings is as follows

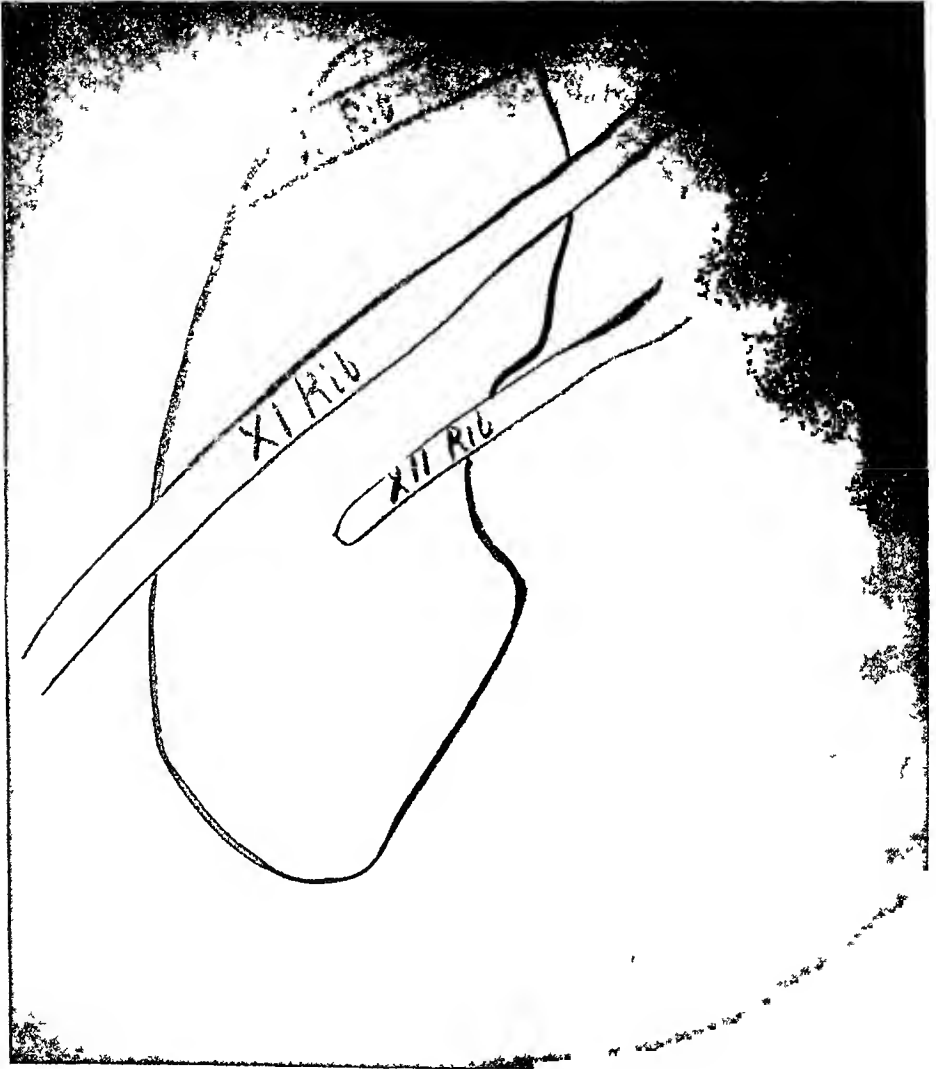
Appearance, cloudy, color, normal, reaction, acid, acidity, normal, specific gravity, 1015 urea, 25 per cent, indican, increased, albumin, trace, marked, glucose, none, diazo, none

Sediment—Amorphous, none, crystals, none, epithelium,



Right k d 3 F om beh d

FIG 2



Left kidney From behind

F G



I ft d f p l      to F m b e h d





large and small round cells numerous cast none red blood cells numerous leucocytes numerous

Remarks—Tissue cells not found Tubercle bacilli not found

April 5 1907—The patient reported to day He has lost 25 pounds in weight but has been fairly comfortable until within the past two months Since then he has frequently passed bloody urine not in large amounts but more often so that for the urine to be clear is the exception The pain in his left flank has been more constant. It is located just to the left of the lumbar spine though there is no tenderness on pressure here or elsewhere in the abdomen

The desire to urinate has increased in frequency and become more imperative Unless he attends to the call at once he often urinates in his clothes

The medicinal treatment seems to have lost its effect He was so wearied with his present condition that he wished some thing done

April 9 1907—Dr Follen Cabot made a second careful examination of the bladder About the left ureteral opening and reaching to the middle line the mucous membrane was inflamed and swollen and the vessels injected and the area red and angry looking There were no growths the prostate was not pathologically enlarged

Urinary examination from the bladder by Dr Hastings shows

*Examination of chole Urine*—Date April 10 1907 Appearance faintly cloudy color normal reaction acid acidity normal specific gravity 1012 urea 176 per cent indican none

Sediments Amorphous none crystals calcium oxalate epithelium few squamous cells casts none albumin trace glucose none red blood cells numerous leucocytes numerous

Remarks—Albumin present red cells and leucocytes numerous no fixed tissue cells found

From the right kidney by ureteral catheter Albumin none Sediment Amorphous none crystals none epithelium few squamous cells casts none red blood cells none leucocyte none

Remarks—Specimen by catheterization of ureter normal microscopically

From the left kidney by ureteral catheter Date, April 14, 1906 Appearance, cloudy, color, pale yellow, reaction, acid, acidity, normal, specific gravity, 1016, urea, 19 per cent, indican, trace, normal, albumin, trace

Sediment—Amorphous, none, crystals, none, epithelium, few squamous cells, casts, none, red blood cells, moderate number, glucose, none, leucocytes, numerous

Remarks—Single epithelial cells, large and small, no cells suggesting new growth as in former specimen

The diagnosis was in doubt Whatever the lesion, it was located in the left kidney

Calculus could be ruled out from the character of the hemorrhages, the absence of renal colics, the negative X-ray findings Tuberculosis was not probable as no T B had been found in repeated urinary examinations, the absence of foci elsewhere, and the general good health of the patient Malignant growth could be excluded as no tumor could be felt and the long duration of the disease without cachexia made its existence seem very improbable

The only positive evidence we had to depend upon was the presence of the posterior kidney pain, the irregular and intermittent hemorrhages and the finding with the microscope of "cells in masses (which) show structure suggesting neoplasm, particularly papillomatous tissue," which Dr Hastings had noted a year previously The most reasonable conclusion was then that there was some benign pathological process in the pelvis of the left kidney, probably a vilous papilloma Operation was undertaken April 13th, with the assistance of Drs Fletcher and Boynton An external perineal section was first done, chiefly to drain the bladder, secondarily to deplete the prostate A skirted cannula was inserted into the bladder and the wound packed

Next the left kidney was exposed through a six-inch oblique incision, the twelfth rib requiring section

The perirenal fat was excessive and in many places was adherent to the kidney capsule It was stripped off and the kidney delivered through the incision without undue tension on its vessels

It was large and presented the characteristic foetal lobulated appearance in a marked degree, but otherwise seemed normal Nothing was seen or felt from the exterior

The cortex was then split to the hilum and a digital examination found nothing. The question what to do next I solved by removing the kidney for it was clearly the seat of some irritation that produced the hematuria. The cure of this condition in our ignorance of the cause of the hematuria without a nephrectomy was problematical the operation was being performed for the sole purpose of relieving our patient and we knew the right kidney was working normally.

The removal of the kidney was accomplished without especial difficulty though there were two large arteries—one to each pole besides the normal renal vessels. These the other vessel and the ureter were ligated separately.

The muscles were sutured with No. 3 40 day chromic gut and the skin with No. 2 10 day chromic gut continuous sutures about a small cigarette drain.

What started out to be a smooth convalescence was interrupted on the third day by the unfortunate breaking of the muscular suture followed by free oozing from the wound and severe shock to the patient. With the assistance of Drs. Connors and Moorhead the wound was reopened and masses of blood clots scooped out. No bleeding points were visible but there was a slight oozing from the entire surface of the perirenal fat.

The region was packed moderately with iodoform gauze the muscles closed with interrupted No. 3 chromic gut sutures and the skin with a No. 2 continuous suture up to the gauze wick.

The case progressed so far as the wounds were concerned satisfactorily and the gauze was gradually removed in the course of the week.

In a month the patient left the sanatorium with a small perineal and lumbar sinus. A report of the urine one week after the first operation shows that there was 48 ounces passed in the twenty-four hours without kidney elements and containing 1 grain of urea per ounce.

The strain of the second operation upset the patient's mind for ten days so that while usually rational by day at night he was quite delirious and unable to sleep.

After trying various sedative hypnotics with hardly any effect I finally stopped them all gave the patient a pint of beer every night and he quieted down slept well and began to gain.

## THE EXAMINATION OF THE KIDNEY

Macroscopically, it was enlarged, deeply lobulated, but presented no naked-eye evidences of disease in the kidney tissue proper or in the pelvis. I concluded I had removed a normal organ. However, after hardening the specimen in a 2 per cent solution of formaline, I examined the kidney again and was surprised to find that the mucous membrane over the entire pelvis of the kidney showed a very fine villous surface with small dark spots here and there.

## MICROSCOPICAL EXAMINATION OF KIDNEY—CASE OF RENAL HEMATURIA

By Dr James Ewing

"The organ shows a moderate grade of chronic productive nephritis, with thickening of the stroma in many *patches*, and general arteritis. *The tubules and cells are practically normal.* The whole organ is in a state of chronic venous congestion, as shown by the dilatation of large veins and distention of glomerular capsules. *The pelvis shows the lesions of long standing pyelitis.* The epithelium is disordered, in places thickened, at other points thinned. The basement membrane is irregular and often deficient, the epithelium lying upon a layer of dense hyaline connective tissue. At many points the epithelium has become invaginated into the subjacent tissue, yielding islands of isolated epithelium similar to those seen in early stages of *pyelitis cystica*. At some points the new connective tissue shows many new arterioles, but it is usually non-vascular. Numerous extravasations of blood are to be found beneath the pelvic epithelium, in the fat tissue, and in and about the dense connective tissue supporting the epithelium. No dilated veins are seen in the pelvic mucosa. Two possible sources of hemorrhage are to be found in this case.

"1 The chronic venous congestion of the whole kidney

"2 The superficial chronic inflammation of the pelvic mucosa, which has produced many new but poorly formed vessels

"The exact points of origin of the hemorrhage were not discovered"

*Subsequent History*—November, 1907. His general health is good. The perineal incision healed in the course of two months. A lumbar sinus exists three inches deep. It discharges a little muco-pus in the course of two or three days sufficient to stain through four layers of gauze. Blood, in a very slight amount, has appeared in the urine first passed after the use of sounds (No 18 English) on two occasions, but there has been no return of the old condition. He still has a contracted bladder.

and chronic cystitis with frequent micturition for which he is under treatment at present. But there is no residual urine.

He has no pain unless he attempts to hold his urine too long. This is more of a sore feeling in the bladder and penis.

The prostate is not enlarged (the left lobe is somewhat smaller than the right) it is not tender to pressure. The urine examination by Dr. Ewing is as follows:

November 6—Appearance cloudy faint yellow reaction slight alkaline specific gravity 1015 albumin slight nucleio albumin small amount serum albumin.

Sediment—Moderate crystals none epithelium many flat casts none red blood cells good many leucocytes many.

Remarks—Appears to be urine of chronic cystitis. Many bacteria present. Very little mucus. Leucocytes in clumps epithelia hydropic.

How may the course of events in this case be explained?

First—The man marries late in life and is very active sexually at the same time withdrawing to prevent conception. This leads to a chronically congested condition of his whole genito-urinary system particularly his prostate and bladder marked by frequent and painful micturition.

Second—There was an occasion of forced retention of urine followed by a free bleeding for a short time. This might mean that the lesion causing the hematuria was in the bladder or in the left kidney. If in the latter the urine might have dammed back into its pelvis and the lesion been located there.

Third—Wherever the lesion was situated it doubtless furnished the atrium for an infection which has since persisted. In the kidney it was sufficient to cause an obstinate hematuria and in the bladder it still requires active treatment.

It is idle to speculate whether the condition was primary in the kidney or bladder. However in view of the fact that the right kidney was not affected that the infection if extending from the bladder would be likely to involve both kidneys and that the second cystoscopic examination showed a decidedly more extensive and active cystitis about the left

ureteral orifice, than had existed at the first examination one year before, I am disposed to think that the "infectious" process began in the left kidney and extended to the bladder, although the latter was in a state of chronic congestion before this occurred

Fourth—The infection in the left kidney eventually developed into a chronic pyelitis as shown by the presence of pus and blood cells (microscopic examination) The final condition has already been described by Dr Ewing, and he calls the lesion a "pyelitis cystica," i.e., similar to the pathological changes found in cases of chronic cystitis

Fifth—The changes in the stroma of the kidney (its essential structure not being involved) were probably brought about as a result of chronic congestion of the organ caused by obstruction to the outflow of urine from the kidney, and to the inflammation of the mucous membrane of the pelvis of the kidney and bladder (about ureteral orifice)

The changes in this kidney seem to be quite different from those mentioned as present in kidneys apparently normal that were removed for persistent hæmorrhage In those cases the usual histological findings have been scattered areas of chronic nephritis involving the tubules or glomeruli

In only two instances in the reported cases which I have read do I find the hæmorrhage apparently caused by pathological changes in the mucous membrane of the pelvis of the kidney

One is reported by MYLES of the case of a woman twenty-six years of age from whom the left kidney was removed after an antecedent nephrotomy had been performed without relief of the hematuria On histological examination diffuse myxangiomaticous change was found in the submucous tissue of the pelvis of the kidney, while the tissues of the kidney were the seat of but slight changes

The mucous membrane of the pelvis was probably in a state of so-called pyelitis cystica

The other is by KEEFE of a farmer, 38 years of age, not a bleeder, whose history dated back six years, when after a cold he had frequent and painful micturition with hematuria The attack lasted two months Three years later he again noticed blood in his urine as small streaks The bleeding increased in amount to the present time The blood is

bright at times at others clotted. He lost thirty-five pounds during the last year.

The urine is red, specific gravity 1029. Alkaline. Large quantity of blood found by microscope. The cystoscope showed the left ureteral orifice red, swollen and pouting. The rest of the bladder as normal. A specimen obtained from the left ureter by catheter showed numerous blood cells but no casts. The X-ray was negative. There was a dull aching pain over the region of the left kidney.

The kidney was exposed, palpated, incised and probed. Nothing was found. Although it appeared normal it was removed.

Microscopical examination of the kidney showed only a few small reddish injected areas in the pelvis. By the microscope one extra injection of blood into the substance of the kidney beneath the cortex was found. The cause of this condition was not evident. In sections of the pelvis a few areas of extravasated blood into the tissue were found. The patient recovered and six months after the operation was apparently perfectly well. The clinical history of this patient is strikingly like the one I have reported, while the gross pathological findings parallel it closely. The histological report is not full enough to warrant an conclusion although here also the two specimens seem coincidentally like. Evidently there is not much doubt but that the pelvis is the seat of the hemorrhages.

#### IDIOPATHIC RENAL HEMATURIA

A brief review of the essential features of this obscure form of renal bleeding may not be out of place.

*Synonyms*—Under the general terms of idiopathic renal hematuria may be grouped all those cases formerly classified as essential hemophilic, angio-neurotic, hysterical and neuralgic renal hematuria and renal hemorrhage without lesion.

With the exception of angio-neurotic hematuria and renal hemophilia this classification of hematuria without gross lesion in apparently healthy kidneys has become practically obsolete since such kidneys have been subjected to careful microscopical examination.

*Etiology*—As mentioned before the kidneys under the microscope usually show some definite lesion. Thus in the majority of cases is a condition of chronic nephritis in small isolated areas involving the tubules or glomeruli or both. As an additional cause I would like to add a chronic lesion of the mucous membrane of the pelvis of the kidney designated pyelitis cystica. However there are a few in



stances recorded in which a careful gross and minute examination has failed to show any change whatever to account for the hematuria, and hemophilia being excluded we must conclude with Schede that the only explanation is by accepting the theory of angio-neurosis. This explanation is, however, clearly begging the question, and it would be just as well to admit that in these cases we do not know what is the underlying cause. The cause which starts the train of pathological changes in the majority of cases is probably an infection which reaches the kidney or its pelvis through the blood or from the bladder. However, only a small number of the cases of patchy nephritis or chronic pyelitis bleed.

The cause of the bleeding is unquestionably some disturbance in the blood supply to the kidney in whole or part, as displacements, changes in body temperature (taking cold), an over-distended bladder, embolism, thrombosis, and other more easily understood causes as calculus, tuberculosis, new growths, traumatism and parasites.

*The quantity of blood lost* may vary from a few blood cells discovered in the urine only by the microscope, to such a profuse outpouring as to endanger the patient's life. It may occur intermittently at long or short intervals, or be practically continuous. There is no special character to it to definitely distinguish it from bleeding due to other causes in the kidney. There is nothing about the hematuria to definitely locate its source, as in the kidney, ureter, bladder, or prostate. However, if the blood is thoroughly mixed with the urine, and if there is the passage of thread-like clots, the source of the bleeding is probably in the kidney.

*Symptoms*—The only positive symptom is the presence of blood in the urine, and the demonstration that it comes from but one kidney. There may be pain but usually this is not present unless the kidney is congested (or distended) and its capsule stretched (as the only sensitive nerves of the kidney are supplied to the capsule). It is located behind in the costo-vertebral angle, and is described as a boring pain.

An attack of renal colic from the passage of blood clots

will present the usual symptoms and help to localize the source of the hematuria

*Diagnosis*—By means of the cystoscope and ureteral catheterization the diagnosis of unilateral renal hematuria is usually not difficult. But without direct inspection of the ureteral orifices and the use of the catheter the location of the hæmorrhage is uncertain. Nothing can be absolutely predicted as to its source from an examination of the urine, and the various segregators are unreliable there are too many opportunities for error.

By means of the cystoscope ureteral catheter and the posterior kidney pain the source of the hæmorrhage having been located in one kidney the determination of the cause is the next problem.

The conditions which may give rise to a hæmorrhage from one kidney are commonly calculus tuberculosis malignant disease or movable kidney.

1 The most common is calculus. A renal colic the passage of sand or calculi in the urine a photograph by the X ray showing a dark shadow in the kidney make the diagnosis almost sure but blood clots may cause colic calculi may come from the bladder or be intentionally put into the urine and a pure uric acid stone throws no shadow under the X ray.

2 Tuberculosis may be concluded on finding the T B in the urine or by innoculating experiments by finding tubercular foci in other parts of the body and from rapid loss of weight. Yet at times a small circumscribed tubercular lesion can exist without giving any evidence of its presence other than by the bloody urine.

3 A malignant growth attended by the tumor and cachexia may be plain but if present to this degree the case is hopeless for surgical intervention and earlier diagnosis may be absolutely impossible if no cancer cells are found in the urine. A severe cachexia not unlike that of malignant disease may be present from excessive loss of blood and a tumor may be felt that is benign in its nature but which is causing the hematuria.

4 If no other condition is found except that the kidney is abnormally mobile this may be the true cause

5 Hematuria from a renal hemophilia would furnish evidences of this condition in the family or personal history of the patient

There is such a strong element of uncertainty present in all the foregoing conditions that positive conclusions cannot be safely drawn until the kidney is exposed and subjected to direct examination. If then the diagnosis in such apparently obvious conditions is in doubt previous to operation, it is much more so in the class of cases to which the one here reported belongs

By excluding the foregoing conditions, by finding blood, albumin and casts, or in the absence of blood only albumin and casts in the urine from one kidney and not the other, we may conclude that the former kidney is the seat of a chronic nephritis, probably in disseminated patches. When blood is present in the urine the reaction for albumin is, of course, obtained. In order then to ascertain the existence of an independent albuminuria, the amount of hemoglobin and albumin must be determined and comparing these an excess of albumin over the proportion of 16 to 1 hemoglobin points not only to an independent albuminuria but also to a renal affection as the cause of the hematuria (Newman). I do not think it is necessary to repeat here the evidence that unilateral localized nephritis may exist, and that this condition is sufficient to explain the hematuria. These facts seem well established. Furthermore the evidence here furnished shows that there may also exist a kidney with normal tubules and glomeruli, and with apparently a normal pelvic mucous membrane (to naked eye inspection) which however, is the seat of chronic inflammatory changes sufficient to cause the hematuria. Of course the proof that these lesions are limited to one kidney (and that the kidney removed is the only one affected) is incomplete. But so long as the urine from the other organ contains no kidney elements we may conclude that the lesion was unilateral.

*Treatment*—If we were certain of our diagnosis the treatment of so-called idiopathic renal hematuria would be comparatively simple. But we are not sure even with the kidney exposed split open and its pelvis exposed to view because the lesion may be found only after prolonged microscopical examination.

The treatment may be expectant or operative. Internal medication should be tried in all cases of mild hematuria when calculus, new growths and tuberculosis can be excluded. This may be supplemented by direct irrigation of the pelvis of the kidney through the ureteral catheter with a solution of adrenalin (Young) or mild antiseptics. This treatment while curative in traumatic renal hematuria would hardly be effective in the class of cases we are considering. It is however worthy of a trial.

In patients growing progressively worse under internal treatment if pain is present or infection exists the treatment must be operative. Surgeons are then compelled to expose the kidney. Direct inspection may clear up the diagnosis. If the kidney is puckered, scarred and mottled in color irregularly or more or less toughly adherent to the surrounding tissues in places some parts of its parenchyma look pale and yellow whilst for the most part it is deeply congested and the knife meets with different degrees of resistance. (Morris) we may conclude that the organ is the seat of a chronic nephritis. Nephrectomy should not be done as the other kidney may be similarly affected. Decapsulation after the method of Edebohl's or decapsulation with transference of the organ into the peritoneal cavity as suggested by Bakes is all that should be attempted.

For hematuria due to movable kidney nephropexy is indicated. Due to a congested and inflamed kidney decapsulation is sufficient. With infection present in the kidney in addition to nephrotomy the organ must also be drained. With a chronic (microscopical) pyelitis one would expect that long continued drainage after nephrotomy might be curative. If circumstances permit after a nephrotomy discharge an apparently

normal kidney, while the operation is arrested for a few minutes, a microscopical examination of a small section from the kidney might indicate the proper course to pursue. In certain cases all of these operations have been successful and in others all but nephrectomy have failed to arrest the bleeding.

If the conditions in the tissues surrounding the kidney, if the state of the capsule or the kidney itself does not afford a fair inference as to the cause of the hematuria, if the symptoms of hematuria, pain and disability, have been steadily increasing under persistent medical treatment, if the other kidney has been proved to be sound, and if the patient and surgeon are not prepared to undergo a possible secondary nephrectomy, the kidney should be removed, because the lesion in such obscure conditions may be chronic pyelitis or a true form of angio-neurosis which are amenable only to the more radical operations.

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# TRANSACTIONS

OF THE

## NEW YORK SURGICAL SOCIETY.

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*Stated Meeting, November 27, 1907*

DR WILLY MEYER in the Chair

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### FUNCTIONAL RESULT AFTER AMPUTATION OF THE BREAST

DR ELLSWORTH ELIOT, JR, presented a woman 35 years old who was operated on June 26, 1906, at the Presbyterian Hospital for a carcinoma of the right breast. The history she gave on admission was that she had one child four years ago which she had nursed for 18 months. About six months ago she noticed a small lump in the right breast to the inner side of the nipple. This gradually increased in size, and as it was regarded as a fibroma, it was removed in the dispensary. Upon microscopic examination the growth proved to be a carcinoma, and the patient was sent to the hospital for a radical operation. This was done by the Meyer-Halsted method, and the patient left the hospital July 6, 1906. The functional result of the operation was practically perfect, all the usual movements of the arm being unimpaired.

### SPLENECTOMY FOR RUPTURE OF SPLEEN WITH SUBSEQUENT CHOLECYSTECTOMY

DR ELLSWORTH ELIOT, JR, presented a woman thirty-four years of age, who was one of two cases of subcutaneous rupture of the spleen that were reported by Dr Eliot at the last meeting of the American Surgical Association, and published in detail in the *New York Medical Journal* for July 13, 1907. The history of the case was as follows:

Eight years ago patient was curetted for retained secundines, four years ago she was operated upon for ruptured ectopic gestation sac, in a condition of almost complete exsanguination. Since then she has been in excellent health.

On May 14, 1906, at ten o'clock, patient fell a distance of nine

feet striking the region of the lower ribs against the edge of an ash can. She was unable to rise and there was severe pain in the left side intensified by movement and by deep respiration. To lie on her left side was impossible and lying on her back was also painful. There has been no vomiting. The pain seemed to diminish for a time and then returned with increasing severity and the patient began to feel weak and thirsty. She was brought to the hospital in an ambulance.

Five hours after the accident the pulse was regular 132 and of low tension. The respiration was shallow and increased in frequency. There was a fracture of the eighth and ninth ribs near the axillary line. Examination of the abdomen showed a diminished respiratory movement on the left side. Rigidity present throughout the entire left side was most marked in the ileocostal space and over the left lower costal arch. Moderate pressure over the splenic area was very painful. In the left flank there was dulness merging with the area of normal splenic dulness above. Elsewhere the percussion note was unchanged. The patient was acutely anæmic and presented the usual appearance of a patient suffering from internal hemorrhage.

Splenectomy was performed six hours after the accident under nitrous oxide gas and ether. A vertical incision was made along the upper outer border of the left rectus above the level of the umbilicus extending from its upper extremity downward and outward along the costal margin a distance of four inches. A considerable amount of clotted and fluid blood was found in the peritoneal cavity and rapidly evacuated disclosing the spleen with a deep rupture two and one-quarter inches long on its internal surface in front of the hilus and on its outer surface denuded of its peritoneal coat an irregularly circular orifice three quarters of an inch in diameter communicating with the larger rent internally. The spleen was double the normal size and was still bleeding. The pedicle was clamped with two strong forceps and the spleen removed. The remaining clotted blood was then quickly washed away with saline irrigation and after the insertion of a cigarette drain to the pedicle the wound was closed leaving an aperture at its lower extremity for the handles of the clamps. The duration of the operation was twenty-one minutes and at its end the pulse being 140 and weak an infusion of 1000 cc of saline solution was given.

During the following night the pulse was at times almost imperceptible and there were several attacks of vomiting, but the patient responded well to stimulation, and at the end of twenty-four hours was in very satisfactory condition. The clamps were removed at the end of forty-eight and seventy-two hours, respectively. The healing of the wound was satisfactory, although there was a gradual rise of temperature to  $103^{\circ}$  F on the fourth day and a continuation of a temperature averaging  $102^{\circ}$  F until the fourteenth day, when it fell to normal. On the nineteenth day there was a sudden rise of temperature to  $102^{\circ}$  F, with the physical signs of fluid in the left chest. At the end of ten days the temperature was again normal and the signs of fluid had entirely disappeared. The patient was discharged in excellent condition at the end of the forty-fifth day.

Since her discharge from the hospital, patient has had several attacks of "indigestion" with pain of moderate or slight severity in the gallbladder region. About forty-eight hours before the second admission, and ten and a half months after splenectomy, she was seized with sharp severe pain in the same region, which radiated to the back, although not to the shoulder, and was intensified by movement from one side to the other in bed and by respiration. There was constant nausea, but only one attack of vomiting on the afternoon of the day of admission, the vomitus consisting of the gastric contents. The bowels had moved each day. The prostration was marked, and at the time of admission the pulse was 110, the temperature  $102^{\circ}$  F, and respiration 44. The patient looked acutely sick, and the pain was then very intense and prohibitive of any movement in bed.

On examination the patient was in the dorsal position, with the thighs flexed on the abdomen. The right side of the abdomen was held rigid and motionless, and was exquisitely painful to the touch. There was intense rigidity of the upper part of the right rectus and to a lesser extent of its lower portion as well. There was well marked resistance of the upper part of the right costal arch and pressure over the arch above the situation of the gallbladder caused pain. The extreme tenderness prevented satisfactory percussion. Under a general anesthetic the gallbladder could be distinctly felt projecting below the border of the liver to a point opposite the level of the umbilicus and forming an oval smooth and deeply elastic tumor.

The operation was performed under nitrous oxide gas and ether. Through a vertical incision parallel to the upper outer border of the right rectus muscle the peritoneal cavity was opened and the gallbladder exposed with the transverse colon and omentum moderately adherent. There was a small amount of clear serous fluid in the peritoneal cavity. The gallbladder was double the normal size and its wall stretched and elastic. It was rapidly and easily separated from the liver above and after ligation of the edge of the gastrohepatic omentum and cystic duct with chromic gut was cut away without its cavity being opened. On opening the gallbladder its cavity contained a considerable amount of turbid serous fluid its walls were thickened and oedematous and near the orifice leading into the cystic duct were two large calculi. The immediate reaction after the operation was satisfactory but by the third she had fallen into a condition of coma from which she could not be roused with a temperature of 103° F and a pulse between 130 and 148 leucocytosis 55,000 polymorphonuclears 90 per cent. Abdominal distention developed together with a fistula discharging freely a yellow brown material. No muscular rigidity or sign of fluid in the peritoneal cavity. The condition grew steadily worse until by midnight of the fourth day it became most alarming and the patient appeared moribund. In an effort to check what appeared to be a form of toxine absorption lavage was given followed by catharsis with colon irrigations. At half past two in the morning patient appeared for the first time to be holding her own and soon after began to show a continued but manifest improvement in that the pulse became slower and stronger and the saline enemata brought away each time quantities of foul fecal material with a considerable amount of flatus. The temperature also gradually fell to 102° F. The coma continued without change and the pupils were still dilated. The condition of the abdomen showed no sign of peritonitis.

Fifth day. Toward noon the coma decreased and the patient seemed to be slightly conscious of her environment. Following a crisis patient had a chill with a rise of temperature to 103° F but by night the temperature had again fallen to 102° F. Late in the afternoon patient began to moan and could be aroused by effort. Although always in a very stupid condition yet on several occasions she asked for water. Her entire condition howed

great improvement, and during the day she was given 48 ounces of fluid nourishment. During the morning the right pupil was slightly larger than the left, but later on both were equal and contracted. This afternoon the pulse was as low as 90.

Sixth day. Patient talked at intervals during the day, and said that she remembered nothing of what had transpired since the operation. The mind was quite clear, and she took increasing quantities of fluid nourishment. Patient looked much stronger, the temperature was as low as 100° F and the pulse in the 80's. The abdominal condition was unchanged. There are still many subcrepitant râles over the left base as well as over the right base, although less abundant. On this day, although the biliary fistula was discharging freely, the conjunctivæ and skin became slightly icteric and the urine showed the presence of bile. Several cultures of the blood failed to disclose any organism.

Subsequent course. The patient continued to gain ground steadily. The jaundice, at first somewhat deepened, had by the end of a week entirely disappeared. The temperature remained, however, irregularly and persistently high, varying between 99° F in the morning and 102° F at night. During this time, the pulse varied between 94 and 115, being usually slightly over 100. On the twenty-sixth day, signs of a small amount of fluid were detected by Dr. James over the right base and about one drachm of slightly purulent fluid was withdrawn by the needle. On the following day the temperature rose to 103° F and the pulse to 140, and immediate thoracotomy was performed under cocaine, evacuating a very small amount of pus. After the operation the patient was restless and somewhat neurasthenic, but never at any time showed any distinct manifestation of hysteria. The discharge from the opened pleural cavity was always small, and after the removal of the tube rapidly healed to a small sinus, with excellent expansion of the lung. For more than two weeks the patient had an irregularly high temperature, but since that time the temperature gradually fell to normal.

#### SPLENECTOMY FOR RUPTURE OF SPLEEN

DR ELLSWORTH ELIOT, JR, also presented a boy of thirteen years, who was admitted to the Presbyterian Hospital on June 10, 1907. On the morning of that day he was run over by an

express wagon a comparatively narrow wheel passing over the abdomen from left to right. The patient was immediately unconscious and was brought to the hospital in an ambulance. Shortly afterwards he became conscious and complained of pain in the left hypochondrium sharp in character and of gradually increasing intensity. On examination there was tenderness and moderate rigidity over the entire upper segment of the abdomen slightly more marked on the right than on the left side. The patient was in moderate shock the pulse being 73 and weak. One hour later the pulse was 80 and the patient was beginning to be restless. Six hours after the accident and just before operation the patient had become acutely anæmic the pulse had increased to 140 and on physical examination dulness was found in the left flank with marked resistance over the lower part of the left costal arch. There was still some rigidity in the upper right quadrant of the abdomen.

Owing to the possibility of rupture of both the liver and spleen an incision was first made in the median line above the umbilicus to which was later added an oblique incision along the edge of the costal arch. On opening the peritoneal cavity a large amount of semi clotted blood escaped. The liver was found to be intact. The spleen was almost bisected through the hilus and was still bleeding profusely. The gastro-splenic omentum was transfixed and ligated with heavy catgut and the spleen removed. The presence of an accessory spleen was noted about the size of a large marble between the layers of the gastro-splenic omentum on the proximal side of the ligature. The semi clotted and fluid blood was then rapidly removed by saline irrigation and the wound completely closed a small cigarette drain only being inserted into the peritoneal cavity at the upper angle. During the operation which lasted fifteen minutes the patient received 1000 c.c. of saline infusion.

For 48 hours after the operation the patient was restless and the pulse varied between 120 and 135. On the third day it decreased to 80 and the subsequent convalescence was uneventful. At no time had there been either palpable glandular enlargement or bony tenderness. The leucocyte count varied from 32,400 on June 10 to 14,400 on July 15 the day of his discharge from the hospital. On November 23, 1907, six months after operation the leucocytes numbered 9,200 polymorphonuclears

42, transitionals, 1, large mononuclears, 1, lymphocytes, 48, basophiles, 0, eosinophiles, 3

Dr Eliot said that in a third case of splenectomy upon which he operated about two years ago the method of clamping the pedicle and leaving the clamps *in situ* was followed with equally good results, and he had come to the conclusion that in those cases where there was need of haste, the application of the clamps was a more certain method of preventing hemorrhage than was the use of gauze packing

DR ARPAD G GERSTER said he was particularly interested in the peculiar comatose condition of the patient in the first case reported by Dr Eliot, and it recalled to mind a somewhat similar experience of his own, of which he was still unable to offer a perfectly adequate explanation. The case he referred to was that of an old lady, very robust and well preserved both mentally and physically, who had borne a large number of children and who was then 67 years old. She was brought to the hospital three days after the beginning of an incarceration of an incomplete inguinal hernia. Upon opening the hernial swelling, a loop of small intestine was found to be gangrenous, as had been suspected, and a resection was done, removing fourteen inches of the gut. The two ends of the gut were joined together by means of a Murphy button. A saline infusion was introduced into the rectum, and the patient apparently bore the operation very well. The diet was restricted to liquids, nothing stronger than sugar water being given.

On the day following the operation the temperature rose to 101.5, and the pulse ranged from 100 to 110. On the second day she gradually lapsed into a state of absolute coma. There was nothing to indicate a cerebral, pulmonary or renal complication, but the woman could not be roused. She had received no anodynes. Her respirations were rather slow and shallow. The abdomen was perfectly soft, the urine was scanty and was passed involuntarily in small quantities. On the third or fourth day she began to pass her stools involuntarily into the bed, accompanied by the escape of copious gases.

Dr Gerster said that in searching for a cause of this patient's coma, it finally occurred to him that it was possibly due to inanition. She had been vomiting for three days prior to the operation and had received very little nourishment since. As she was

unable to swallow a tube was introduced into the stomach and she was given a pint of peptonized milk. Shortly afterwards she began to show signs of animation within three or four hours she opened her eyes and from that time on her recovery was uninterrupted.

DR WILLY MEYER in discussing Dr Eliot's plan of clamping the pedicle of the spleen and leaving the clamps *in situ* said he thought he would under ordinary circumstances be better satisfied to ligate the pedicle unless it was very large as in Dr Eliot's case and there was danger of injuring the vessels in piercing it with the Deschamps needle. For about 18 months the speaker said he had followed the plan of using temporary clamps in nephrectomy as a routine treatment and after having had six successful cases by that method he ventured to employ it in the case of a young lady the daughter of a colleague who was tuberculous and very anæmic and was operated on at her residence. In this instance unfortunately a hemorrhage occurred when the clamps were removed on the fourth day after operation. A small rent in the afferent part of the renal artery was the cause. Although it was finally removed successfully the patient died after 24 hours. Dr Meyer said he would never resort to the clamp method again in kidney work except being forced to do so.

The speaker said he had seen one case of this peculiar coma after gastroenterostomy in which he did the operation with the short loop. The patient did well for about 36 hours and then lapsed into a condition of coma. She was treated with hypodermoclysis of saline solution three times a day for three days on the fourth day she slowly recovered consciousness and made a good recovery. In that instance he attributed the condition to auto-intoxication from the intestinal tract although it might perhaps have been due to inanition as suggested by Dr Gerster.

DR ROBERT H. M. DAWBARN in discussing the subject of artificial feeding apropos of Dr Gerster's case said that his experience had convinced him that the best food and fortunately most simple and easily prepared was milk (or cream) peptonized to extreme bitterness plus sugar of milk. By this means a pint or less as tolerated and retained three times in twenty four hours and avoiding the rectal tube which very soon became an irritant however gently used—gravity taking its place—he had



nourished one patient (each injection following a prolonged hot oil massage everywhere) for six months. During this period nothing but water had entered the stomach. This person, who died of inoperable carcinoma of the stomach, and *not* from starvation, weighed after death nearly two pounds more than at the beginning of treatment. He called attention to the fact, moreover, that grape sugar was quite an irritant and that it was not wise to continue its use as a food for more than a very brief period. Only two-tenths of one per cent of this sugar is to be found in the blood at any one time, the balance escaping through the kidneys as a foreign body, producing a temporary glycosuria, although it had never been known to cause nephritis or diabetes mellitus.

Dextrin, on the other hand, while an excellent article of food, was objectionable in some cases, recently sutured wounds of stomach or gut for instance, because it excited peristalsis and indeed does so more strikingly whether fed by stomach or bowel than any other dietary article. It is, on the other hand, our best reliance when there is stoppage of peristalsis, such as in the paralysis of bowel and stomach so often seen following operations for gangrenous appendicitis. Regarding starch, it was, though slowly, digested in both the small and large intestines, and at least one-half of the amount introduced was finally absorbed into the blood. Differing from dextrin, it did not excite peristalsis of the stomach or bowels.

Far too little attention, Dr. Dawbarn said, had been devoted to the subject of artificial alimentation, whether by bowel or skin, especially in this country. Animal oils were capable of rather greater absorption by the skin than vegetable oils. These facts he had ascertained a number of years ago after considerable experimentation.

Cod liver was one of the best of the animal oils, but was objectionable, when heated—as all oils must be to be absorbed freely—on account of its atrocious odor, then greatly exaggerated. Old fashioned goose grease, or hens' or turkeys' oil, were excellent, perhaps best of all, but quite expensive. A very satisfactory substitute was any one of the so-called "sweet-oils."

DR. ELIOT, in closing, said the comatose condition of his patient was thought at the time to be possibly due to the fact that the spleen had been removed, and acting on that supposition

she was fed for a time upon an infusion of fresh sheep spleens Under that treatment the coma seemed to decrease somewhat

### CARCINOMA OF THE MALE BREAST

DR WILLY MEYER in presenting a man 48 years of age said that this was the only case of carcinoma of the male breast that had come under his care since he had been doing the radical operation devised by him in 1894

This patient when he was operated on four years ago had a characteristic scirrhus cancer of the left breast The operation was done in the usual manner and the functional result was very good In all of these operations Dr Meyer said he never made an effort to spare the skin and then attempt to close the entire wound by sutures unless the edges could be readily brought together He preferred to make a sweeping incision around the base of the breast and then cover the defect by grafting There were no signs of a recurrence The speaker said that in 39.5 per cent of his cases of radical operation for cancer of the breast there had been freedom from recurrence for a period of between three and twelve and a half years in 30 per cent there had been freedom from recurrence for from five to twelve and a half years 30 to 40 per cent seemed to be permanently cured Fifty per cent died within the first three years after operation the majority of those that safely passed the three year limit promised a permanent cure

### STUDIES IN TECHNIQUE OF CANCER OF THE BREAST OPERATION

DR ROBERT H M DAWBARN read a paper with the above title for which see page 374

DR GERSTER said that it would be ungracious not to thank Dr Dawbarn for extracting from oblivion the proposition made by himself systematically to attack cancer of the breast from the axillary end and thus to diminish the danger of dissemination and to save blood

Dr Gerster said further he did not think the theoretical objections raised by the reader of the paper to the practice of making punctures of the breast for diagnostic purposes were well taken A puncture cautiously done was less apt to cause

dissemination of the tumor infection than an incision, and the fact should always be borne in mind that a woman's breast should not be sacrificed without good reason

The method of availing one's self of the immediate examination of frozen sections of a suspicious breast tumor was quite universally employed in the large hospitals in this city, and at the Mt Sinai Hospital it was followed as a regular routine. Gummata of the breast were not infrequently mistaken for cancer, and the speaker said he never operated on a breast tumor without first giving the patient the benefit of a thorough course of treatment with large doses of potassium iodide for at least five or six days. By that time, if the growth was a gumma, especially if one of recent formation, it would begin to disappear, and the speaker said he recalled several instances where this simple precautionary measure had been the means of saving a breast.

Dr Gerster said that under the very sound and rational teachings of Dr Halsted and others, wonderful improvement had occurred during the past quarter century in the functional results after amputation of the breast, and that despite the extensive removal of the pectoral muscles. The main object of the radical operation was not to get a beautiful result, but to save life, and take chances with the wound afterwards. The better functional results to-day the speaker ascribed to the fact that suppuration was the exception rather than the rule and that the arm was not bandaged to the thorax as it was formerly. The apparatus for improving the functional condition of the arm demonstrated by Dr Dawbarn was apparently sound in its principles, but it would probably prove irksome to the patient, and the same object could practically be accomplished by not bandaging the arm at all, simply passing a spica around the shoulder so as to hold snugly the dressings in the axilla.

The patient should be permitted to move the elbow, and the scar in the axilla should be allowed to heal with the arm in the posture of extension.

Dr Eliot mentioned a case of supposed carcinoma of the breast which upon section proved to be one of abscess, but subsequently the microscope showed carcinomatous tissue in the abscess wall, and he raised the query whether in these cases of extensive abscess it would not be better to sacrifice the breast, excepting perhaps in young patients. He emphasized the impor-

tance of making a histological examination in these doubtful cases at the time of operation

DR DAWBARN in closing said that while the puncture of a suspicious breast tumor opened comparatively few lymphatics these could not be sealed whereas the multitude of lymphatics opened by an incision could be readily sealed within a few seconds by the use of Harrington's fluid for example Not in the instance of Syme's advice in search for a thick walled deep collection of pus where we intend to cut to the centre of the tumor at a stroke but in almost all other instances where we wish to remove for microscopic diagnosis a small piece of a tumor Skene's hawkbill scissors is the best because quite the quickest tool to use

It was not probable in a case of the kind referred to by Syme that mere drainage would suffice Doubtless excision of the dense walled abscess would be best Where by freezing microtome (if the abscess wall looks suspicious) malignancy is established the radical operation for cancer should of course be done but if non malignant he could not agree with Dr Eliot in advocating the mutilating operation

As to the opinion expressed by Dr Gerster that the new position of the upper extremity would prove irksome (obtained by aid of the familiar triangular splint shown by the speaker for hastening the return of certain important movements otherwise more slowly regained) —the speaker replied that the splint seemed to him as simple as possible Some of the patients as yet few in number upon whom this had been used did not complain of it at all Its use is never maintained for more than a week at most Those who did find it tiresome (as any immobilization whatsoever quickly becomes to certain people) were relieved and made comfortable by simply releasing the fore arm Ochsner of Chicago accomplished the same thing with the use of a sling and tackle by which the arm was elevated traction from the comfortably padded hand being employed directly upward Dr Gerster's choice of arm posture (abduction to a right angle with the body) is obviously a very great gain over the custom with most operators unfortunately still the rule of bandaging this member close to the side with the regular result of months of greater or less misery before the scar is stretched to permit of the patient doing her hair This abduction however renders impossible its employment of the speaker's muscle grafting plan

*Stated Meeting, December 11, 1907*

The President, DR JOSEPH A BLAKE, in the Chair

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### NEPHRECTOMY FOR TUBERCULOSIS

DR ALEXANDER B JOHNSON presented four patients who had been subjected to nephrectomy on account of tuberculosis of kidney

The speaker said he showed these cases because they illustrated fairly well certain points. One of these was that it was possible to obtain a satisfactory result in tuberculosis of the kidney even though the process was far advanced and associated with an infection of the tissues around the kidney, whether of tubercular or septic origin. The second point was that nephrectomy was the only operation that promised a favorable result. In three of his cases there was a large tubercular peri-renal abscess, and in one instance it was impossible or impracticable to remove the kidney as a primary operation, because the condition of the patient did not seem to warrant it. In two of the cases the kidney was removed at the same time that the peri-renal abscess was opened, and although the convalescence in one of those cases was slow, it was satisfactory. In the fourth case the condition was not tubercular, but pyogenic, and probably due to multiple renal calculi. That case was a good illustration of the fact that a cure could not have been effected excepting by nephrectomy, a nephrotomy having already been done and failed.

The first case was a man, 44 years of age, who entered the hospital in August, 1906. There was no history of venereal disease. Four years before he had commenced to suffer from painful and frequent urination. His urine had become purulent. He had not passed blood. He had not suffered from pain at that time referred to the region of the kidney. He had slowly but steadily lost flesh and strength. During the four weeks preceding he had had continuous dull pain in the left lumbar region. His urine had been at times very cloudy and during other shorter intervals quite clear. Two weeks before he had first noticed a swelling in the left flank which had become red and tender. He had lost much flesh and become very weak. Upon physical examination he was seen to be emaciated and profoundly anemic.

There was a large fluctuating swelling in the left flank moderately tender extending well down below the umbilicus and from the outer border of the quadratus lumborum muscle nearly to the median line in front. The patient had a daily evening rise of temperature and looked very ill indeed. His urine contained much pus but no tubercle bacilli were found. The abscess was incised and was found to communicate with the kidney. Owing to the very feeble condition of the patient and the very dense adhesions surrounding the kidney it was thought best not to attempt to remove the kidney at that time. A portion of the kidney was removed merely of sufficient size for pathological examination. It proved to be the seat of tuberculosis. The patient's general condition improved greatly and two months later he was able to leave the hospital in fair general health but with a tuberculous sinus leading to the kidney. He refused to have his kidney removed at this time. Six months later he re-entered the hospital with another abscess and in bad general condition. The abscess was incised he again improved but returned six weeks later to have his kidney taken out. This was done by an incision below and parallel to the ribs. The removal of the kidney was difficult on account of the dense adhesions. After this operation he made a good recovery. His wound healed. His general health improved and his urine ceased to contain pus. The kidney showed advanced tuberculous lesions. His general health at the present time is good six months after the last operation.

The second case was a woman 32 years of age who was admitted to the hospital September 9 1907. One year before she had commenced to have continuous pain in the right lumbar region. Her urine had become purulent. From time to time she had had attacks of pain referred to the right loin. No tubercle bacilli had been found in her urine. She had lost much flesh and strength and had become markedly anemic. The cystoscopic examination of the bladder showed the bladder wall congested. The orifice of the right ureter was red and swollen. Purulent urine could be seen escaping from it. Catheters could not be introduced. The left ureter opening appeared normal. The patient's general condition was poor. She was feeble and anemic and had a daily evening rise of temperature with occasional sweating at night. The right loin was occupied by a large

elongated, tender tumor extending downward as far as the navel and upward beneath the ribs. The tumor was fixed. The colon lay to its outside but crossed it in front. The right kidney was removed by an incision below and parallel to the ribs. The tumor was found to consist in its lower half of a large pyonephrotic kidney showing the lesions of an ancient tuberculosis upon which had been engrafted a secondary pyogenic infection. The kidney measured  $12 \times 7 \times 8$  cm. The upper half of the tumor consisted of a large abscess lying between the diaphragm and the kidney. The kidney was removed and the abscess evacuated, its walls were scrubbed with masses of sterile gauze. The patient made a very good convalescence and the very large wound healed for the most part per primam. She rapidly gained flesh and strength. Her urine ceased to be purulent. At the present time, two and a half months after the operation, her health is excellent.

The third case was one of pyogenic infection of the kidney. He was a man 46 years of age. An Italian. Admitted on July 6, 1906. Two weeks before he had commenced to have pain in the right loin, accompanied by chills and fever with diarrhoea. His urine had become cloudy and he had increased frequency of urination. Upon admission to the hospital he was anemic, emaciated and distinctly septic. There was marked pain and tenderness over the right kidney and muscular rigidity of the muscles of the right half of abdominal wall. His urine contained a large amount of pus. On the day following his admission he was operated upon by another member of the attending staff of the hospital, who exposed the right kidney and incised and drained an abscess cavity in the lower pole. The patient remained septic after this operation, his urine continued purulent. Two weeks later the kidney was removed by Doctor Johnson through an incision below and parallel to the border of the ribs. The kidney was the size of a large grape fruit. The outer surface was rough. The capsule was densely adherent. On section, the pelvis and calices were found greatly distended with thick grayish pus containing many pyogenic cocci and a large number of minute uric acid calculi. The patient made a rapid convalescence and has since remained in good health.

The fourth patient was a case of tuberculosis of the right kidney, with a large peri-renal tubercular abscess. The patient was a married man, 34 years old whose previous history was

negative. He stated that during the past few years he had not been as robust as formerly. He had no cough. For more than a year he had moderate soreness in the right lumbar region. During the past nine months he had been steadily losing flesh and strength. He had had night sweats. He had never had any sharp pain in the region of the kidney, ureter, testis or glans penis, nor had he ever suffered from frequent or painful urination. He had never passed blood, but had noticed for several months that his urine was cloudy. The sputum and stools were negative for tubercle bacilli. The urine contained a moderate amount of pus and a few blood cells. Tubercle bacilli were found in the urine on one occasion after many trials, otherwise the urine was normal in quantity, specific gravity and content of urea. The patient was emaciated and feeble. He had attacks of diarrhoea, with an evening rise of temperature followed by a cold sweat almost every night.

Upon inspection there was a distinct fullness of the right flank extending downward in front as far as the crest of the ilium. There was tenderness and rigidity of the abdominal wall on that side extending nearly to the median line with a diffused sense of resistance, but no tumor could be definitely outlined on account of the rigid contraction of the muscles.

A diagnosis of tuberculosis of the right kidney was made with tubercular peri renal abscess and probably a nearly imperious ureter. An incision was made below and parallel to the ribs opening into a peri renal tuberculous abscess which extended downward into the right iliac fossa and required a subsequent oblique incision nearly at right angles to the first to drain it. The kidney was found surrounded by a dense thickened fatty capsule firmly adherent to the surrounding structures. It was removed with some difficulty together with as much of the tubercular ureter as could be reached. The tuberculous abscess cavity which appeared to extend nearly to the bottom of the pelvis was curetted and the large wound was partially closed, packed with gauze and drained. There was marked shock from which the patient slowly recovered after stimulation and infusion.

An examination of the extirpated kidney showed two large cavities near the surface each about three and a half centimeter in diameter, one having a smooth wall like a retention cyst the other a roughened and partly caseous wall. Miliary and slightly



larger tubercles were numerous throughout the cortical portion of the organ. The lumen of the pelvis and ureter were enlarged, their walls were thickened and they contained many miliary tubercles. There was some ulceration of the pelvis, and a chronic interstitial inflammation of the kidney. In many respects the lesion appeared to be a comparatively recent and active one.

The patient survived the operation, but the very large wound closed slowly. After several months a second operation was done to afford better drainage for the large cavity, which extended into the pelvis. It was thought that the stump of the ureter was the cause of the tardy healing, but careful search failed to disclose any sinus which seemed to lead to the base of the bladder. The whole wall of the rather large wound was curetted, and after this the wound slowly healed down to a sinus which remained open many months, but finally healed after a sojourn in the country. In the meantime the patient's general health had improved. Four years after the operation he was still in perfect health, leading an active life and weighing nearly 200 pounds. His urine remained clear and normal and he had no bladder nor other urinary symptoms. His condition at present (five years after the operation) was one of perfect health.

DR HOWARD LILIENTHAL said that while he was willing to admit that a calculous pyelonephritis was rarely cured by a nephrotomy, he had seen such a favorable result in several instances. He recalled one case which had been operated on a number of years ago by Israel for a pyelonephritis of the right kidney. After long-continued suppuration of the opposite kidney Dr Lilienthal removed a calculus therefrom and after this the ureter became plugged for a time and the urine became absolutely normal, coming entirely from the kidney first operated on. The question was largely one of drainage. If the ureter was pervious and permitted of proper drainage, the speaker said he saw no reason why such a kidney should not recover after a nephrotomy. Otherwise, of course it should be removed. Because pyelonephritis due to stone was seldom cured by nephrotomy was no reason for denying the operation a good chance. In fact, under certain conditions, it should be the first procedure even though nephrectomy became necessary later. The mere fact that a kidney was tuberculous did not constitute a sufficient reason for nephrectomy, that operation depended more on the extent of the

tuberculous destruction and many cases of tuberculosis of the kidney recovered without operation. Of course in dealing with extensive abscess formation and when the patient was going down hill the kidney should be removed if its fellow were healthy.

In discussing the question of the removal of the ureter in these cases Dr Lohenthal said the method he had practiced was to first complete the nephrectomy and then if necessary at a subsequent time make an extra peritoneal lateral incision for exposure of the ureter. By this method the upper portion of the ureter could be pulled away and the lower end was well exposed and could be cut off as close to the bladder as was necessary.

DR SAMUEL ALEXANDER in discussing the best incision or approach to the kidney said he believed the incisions usually employed were unnecessarily extensive. Personally he used a crescentic incision beginning about an inch or two in front of the angle formed by the twelfth rib and the erector spinæ muscle. The convexity of the incision was directed backward and the lower arm of the crescent ended at a point about two inches below the crest of the ilium which gave an excellent exposure of the kidney and access to the upper part of the ureter. The speaker said that in tuberculous cases the amount of the ureter that was necessary to remove was very small. In cases that were likely to recover after operation the infection if primarily renal was limited to the upper segment of the ureter. In this connection the speaker called attention to the fact that the upper and lower segments of the ureter were the only portions containing lymphoid tissue and for that reason were the sections most likely to become infected.

As to the choice of operation in tuberculosis of the kidney Dr Alexander said that in cases where the diagnosis was positive he thought there was no question that a nephrectomy was indicated. In such cases the removal of the focus of infection was necessary for a cure. In pyelonephrosis of colon bacillus origin where there were no sacculations a nephrotomy with drainage of the pelvis of the kidney was all that was necessary.

DR F. TILDEN BROWN said that surgeons had now fairly well agreed that if any operation was to be done for tuberculosis of the kidney that operation was nephrectomy whenever possible. The position, size and shape of the incision was to be determined

by the conditions in each individual case. He was inclined to believe, however, that in the treatment of these cases we were on the verge of something else besides operation, namely, the use of tuberculin. He had had some experience both impersonal and direct with this, which has led him to be rather optimistic over its use in the treatment of not too extensive chronic tubercular disease of the genito-urinary tract.

Dr. Brown approved of Dr. Lihenthal's method of gaining access to the kidney and lower ureter through a separated retro-peritoneal lumbar and iliac incision. But was inclined to criticize this operator's surgical conservatism in cases of tuberculous kidney, especially in view of the radical measures he advocated for the corresponding ureter. The speaker expressed his belief that the ureter, when once relieved of the tuberculous kidney, would often take care of itself. At the time of division of the ureter, however, very careful asepsis should be maintained, against any soiling of the surrounding tissues. Too much care with underlying gauze protection could not be exercised in dealing with the ureter wherever severed, it required just as careful attention as did the appendix and much the same technic. After ligation of the vessels of the pedicle of the kidney and its attached part of the ureter, the speaker thought it an effective yet conservative measure to use a long-handled, very small, sharp curette to bring out the mucosa of the ureter, or else inject a small quantity of a strong antiseptic or escharotic.

In the vast majority of cases of tuberculosis of the kidney, Dr. Brown said, the condition should be dealt with in a radical fashion. The only case of that kind regarding which he had any regrets was one which he had been at the time strongly inclined to commend for seeking conservative treatment at the hands of a colleague. That patient had since died from an extension of his disease, while other more desperate cases that had been dealt with radically were still alive and well. In fact the speaker was unable to recall an instance of death from any cause yet among his fairly numerous series of cases operated on for unilateral renal tuberculosis.

DR. WILLY MEYER said that in cases where we could prove that one kidney was tuberculous while the other was healthy, it was our duty to remove this primary focus of the disease, in spite of the fact that conservative treatment might at times

be followed by favorable results inasmuch as a definite prognosis in the given case was a clinical impossibility

In dealing with the ureter in these cases it usually sufficed to remove as much as could be conveniently reached from the primary incision followed by an injection into the stump of the ureter of a small amount of pure carbolic acid followed by alcohol. The cut end of the ureter should always be ligated if the cystoscope showed ulcerations about the ureteral orifice. The speaker recalled one case where after nephrectomy the urine from the opposite kidney found its way through the untied cut end of the ureter that had been left behind due to ulcerations around the vesical ureteral mouth which had destroyed the physiological muscular sphincter.

DR JOHNSON in closing said he had removed many kidneys through the anterior incision such as he had described in connection with his cases and he had seen many patients who had been operated on by others by the same method and he had not observed a single case in which a hernia followed although he had heard of one or two such cases. One of the advantages of this particular incision was that it exposed the front of the kidney and after tying the vessels of the pedicle the enucleation became a very simple matter. The speaker said he did not know of any other incision excepting a very long one extending downward and forward which possessed this particular advantage. He agreed with the other speakers that the stump of a tuberculous ureter rarely gave rise to trouble if one removed as much as could be conveniently reached as far as the brim of the true pelvis. Nephrectomy was certainly the operation that was indicated in cases where the tubercular lesion was limited to one kidney and it was also the best procedure in pyelonephrosis. He could not recall a single instance of this kind in which the patient's condition was notably improved by a nephrotomy. Another point to bear in mind was that when once the kidney had been incised for pyelonephrosis a subsequent operation for its removal was rendered much more difficult and dangerous. That such a necessity frequently arose the speaker said he could testify to from his own experience.

#### SARCOMA TREATED BY MIXED TOXINS

DR WILLIAM B. COLEY presented the following three cases

CASE I—*Round celled Sarcoma of the Back Three Times*

*Recurrent, Final Disappearance Under the Mixed Toxins of Erysipelas and Bacillus Prodigiosus Well at Present, Two and a half Years Later.*

W J., male, aged 14 years Family history good In the latter part of August, 1901, the patient fell from a stoop, striking on his back Two or three weeks later the mother noticed a swelling in the midscapular region, a little to the left of the median line. This swelling increased very rapidly It was soft and fluctuating from its beginning The patient was referred to Dr Coley in December, 1901, by Dr Polhemus, of Nyack, New York Physical examination at that time showed a cystic swelling the size of an orange in the left scapular region The skin was normal, the tumor fluctuating, situated apparently just beneath the skin and superficial fascia On January 12, 1902, an incision was made under ether and several ounces of dark blood were evacuated There was no evidence of any solid tumor at this time The wound closed without drainage and healed by primary union About three weeks later a tumor began to develop at the original site, this was also cystic in character, increased rapidly in size until May, when it had become one-third larger than at the first operation Dr Coley then operated again under ether anesthesia, finding at this time, in addition to fluid blood and clots, such a thickening of the walls of the cyst as to make him suspicious of sarcoma A portion of this thickened tissue was removed and examined by Dr H T Brooks, Professor of Pathology at the Post-Graduate Hospital, who pronounced it small round-celled sarcoma of high vascularity Two weeks after the operation and before the wound had entirely healed, the X-ray treatment was begun and continued three times a week The treatment was kept up the entire summer and fall of 1902 In December, 1902, there was well-marked evidence of local recurrence in and about the cicatrix The tumor continued to increase in size in spite of X-ray treatment On January 26, 1903, Dr Coley operated a third time under ether anesthesia and removed the recurrent tumor together with the old cicatrix The wound healed by primary union Shortly after he left the hospital, the X-ray treatments were resumed, and continued once or twice a week during all of 1903 and the first half of 1904 In June, 1904, there began to appear signs of another recurrence in the old cicatrix, and this time, in addition to the X-ray, the local injec-

tions of the mixed toxins of erysipelas and bacillus prodigiosus were begun. The injections were continued until June 1905 with the result that the recurrent tumor disappeared and the patient has remained perfectly well up to the present time six years after the first operation and three and a half years since the toxin treatment was begun.

CASE II—*Interscapular Thoracic Amputation for Sarcoma of the Humerus Recurrence Disappearance Under the Mixed Toxins of Erysipelas and Bacillus Prodigiosus*

G M W female aged 15 years. The patient received an injury to the arm ten years ago by running against a banister. She first noticed pain in the upper portion of the right arm near the shoulder in December 1906. Two to three weeks later a swelling appeared which increased in size rapidly. In February 1907 she consulted a physician who treated her for rheumatism.

The patient was referred to Dr. Coley by Dr. V. P. Gibney in June 1907. Physical examination at this time showed a pear-shaped enlargement of the right humerus involving the upper two thirds. The circumference was three inches larger than the other arm. The mixed toxins of erysipelas and bacillus prodigiosus were tried for two weeks with the hope of saving the arm. At first there was a slight decrease in size but later the tumor increased in size and amputation was advised. After two weeks of deliberation the family finally consented to an amputation.

On July 11, 1907, with the assistance of Dr. W. A. Downes at the General Memorial Hospital, Dr. Coley performed an interscapulothoracic amputation. The clavicle was sawn through at about the middle with a Gigli wire saw. The subclavian vein and artery were easily found and ligated. The nerves of the brachial plexus were then injected with a one tenth of one per cent solution of cocaine. The operation was then easily completed with almost no loss of blood. At the point of division the lumen of both vein and artery was found nearly blocked by sarcomatous thrombi. The glands under the arm were also invaded. There was practically no shock following the operation and the patient made an uninterrupted recovery. It was Dr. Coley's intention to have the toxins started as soon as she was over the operation but as he was absent from town this was not done and she returned home. At his examination early in October

he found evidence of local recurrence in the pectoral region, just above the breast and also in the upper portion of the wound in the clavicular region. She was re-admitted to the General Memorial Hospital on the 10th of October, and for the last six weeks has had the injections with the mixed toxins on an average of three to four times a week. She has gained four pounds while under the treatment, and her present general condition seems perfect. All evidences of local recurrence have disappeared.

CASE III — *Inoperable Spindle-celled Sarcoma of the Abdominal Wall and Pelvis Treated with the Mixed Toxins of Erysipelas and Bacillus Prodigiosus from December, 1892, to June, 1893, Entire Disappearance, Patient Well at Present, Fifteen Years Later*

J. F., aged 16 years (at the time the treatment was begun), suffering from a large tumor involving the lower portion of the abdominal wall, attached to the bladder and pelvis. The patient, who was confined to his bed and had lost considerable weight, was referred by Dr. L. Bolton Bangs, in December, 1892, as a totally hopeless, inoperable case. A portion of the tumor was removed for microscopical examination, and was pronounced spindle-celled sarcoma by Dr. H. T. Brooks, pathologist at the Post-Graduate Hospital. He received injections with the mixed toxins of erysipelas and bacillus prodigiosus from December, 1892, to June, 1893. At the end of this time the tumor had entirely disappeared. The patient received no further treatment and has remained perfectly well with no signs of recurrence up to the present time.

This case, in addition to representing the oldest cure (well nearly fifteen years) obtained by the toxine injections, is of peculiar interest from another standpoint, *i e.*, the theory of possible syphilitic origin. The age of this patient was sixteen years at the time the treatment was begun, there was absolutely no history nor evidence of congenital syphilis. Six to seven years after the tumor had disappeared in this case and the boy had grown up into manhood, he contracted a typical primary lesion of syphilis, which ran the usual course, practically proving that his original tumor of the abdominal wall and pelvis which had disappeared six years before under the toxin treatment, was really spindle-celled sarcoma, as shown by the microscope, and not a syphilitic growth.

## VOLKMANN'S ISCHAEMIC PARALYSIS OF FOREARM

DR HOWARD I LIENTHAL presented a boy  $4\frac{1}{2}$  years old who was admitted to the Mount Sinai Hospital on April 20 1907 His previous history was unimportant About five and a half months ago the patient fell from a chair about three feet high he struck on his right hand and was supposed to have sustained a fracture about the elbow joint He spent ten days in the Brooklyn Hospital where an adhesive strap dressing was applied with the forearm flexed upon the arm at a very acute angle and over this an immobilizing bandage was applied For four days after the straps were removed the fingers were held straight they then began to flex and the flexion had slowly progressed Coincident with this flexion of the wrist had developed and the patient had complained of slight pain in the fingers The condition had been treated with rubbing and electricity There had been no athetoid movements no convulsions

Examination of the affected wrist showed that it was in a position of permanent adduction Abduction both active and passive was impossible on account of muscular interference The forearm was in a position of almost complete pronation Passively complete pronation could be produced Supination was impossible There was complete reaction of degeneration in all the muscles of the hand excepting those of the thumb the latter reacted normally Nerve reactions as well as all sensations were normal The hand was cool up to an inch below the wrist above that point it was warm Neither the radial nor ulnar pulse could be felt nor any other pulsating vessel in the hand or forearm

The muscles of the forearm had a dense hard board like feel suggestive of a fibrous change All active movements were very weak The external condyle of the humerus was twice as large as that on the corresponding side and occasional crepitus was elicited over the external condyle on flexing or extending the elbow There was a superficial recent scar over the styloid process of the ulna

On April 29 a well padded dorsal splint was applied for four hours When it was removed there was a skin necrosis on the dorsum of the wrist On May 24 an inch and a half incision was made over the most superficial portion of the radius and over the ulna About an inch of each of these bones was then removed



sub-periosteally with the cranial rongeur, the radius was hollowed out and an aluminum splint an inch and a half long and with an outside diameter of one-quarter inch was implanted into it. The ends of the divided ulna then came accurately together. The skin was sutured with silk, and a plaster-of-Paris dressing applied with the wrist extended. A specimen removed from one of the involved muscles showed an interstitial myositis, with atrophy.

On September 14, 1907, the movements of the fingers and hands were slightly improved.

Dr. Lilienthal said he had seen two other cases of ischæmic paralysis of the forearm following Colles' fracture.

DR. ALFRED S. TAYLOR said that in a case which came under his observation about four months ago there was a history of an old fracture of the humerus, just above the elbow. There was marked deformity, and a cicatricial mass occupied the place of the flexor muscles in the forearm. The ulnar and median nerves were also involved in this cicatricial mass. Dr. Taylor resected one inch of each bone of the forearm. Slight improvement followed the operation. Hyperæmia from obstruction of the blood current by the Bier method was applied for two hours each day, and helped to soften the cicatricial mass somewhat.

In all these cases, Dr. Taylor said, the condition of the nerves should be examined. In the case he had reported both the median and ulnar nerve were found to be compressed. Now after six months returning nerve power is evident.

DR. CHARLES N. DOWD said that this was the third case he had seen of fracture about the elbow joint followed by this peculiar form of paralysis in which the bandage pressure had not been sufficient to injure the skin, and he had seen other cases in whom skin ulceration and direct muscle injury were present. It was certainly a condition that surgeons had reason to fear. The speaker said he believed that some peculiar susceptibility of the patient to injury from moderate pressure might well be an influence, that it was still a question whether injury of the nerve had anything to do with it. In one of his cases he found a spicule of bone pressing on the median nerve, while in another case the nerve was displaced.

The deformity seemed to be due to a hardening and atrophy of the muscle itself, as described by Volkmann in his original

description of the condition. He advised Dr Lilienthal to leave his case alone as the flexor muscles had very little action. In the two cases that had been under his observation he did not resort to any bone operation and the condition improved somewhat under massage.

DR JOSEPH A BLAKE mentioned one case where after a fracture above the elbow the tissues of the arm seemed to undergo this same form of degeneration and the nerves which were dissected out were apparently in the same condition. The patient improved somewhat under massage but was lost sight of.

DR LILIENTHAL in closing said he believed that tendon lengthening and the freeing of the muscles had been attempted in these cases but without good results. The speaker said he did not look upon tendon lengthening as a favorable operation in a case where so many tendons were involved.

#### THORACOPLASTY FOR SINUS AFTER EMPYEMA FOLLOWING SUBPHRENIC ABSCESS

DR CHARLES A ELSBERG presented a young man of 22 who was admitted to the Mount Sinai Hospital on June 23 1907. The patient gave a nine weeks history of fever cough and rapid loss of flesh and strength. There was a large mass in the right lumbar region and signs of fluid in the right pleural cavity. A subphrenic abscess bulging into the perinephritic space was opened through an incision below the twelfth rib the empyema drained by the resection of the ninth rib. The pus from both regions contained the streptococcus in pure culture. The patient's condition grew steadily worse high fever and rapid pulse persisting. He suddenly developed a large inflammatory mass in the back which was opened widely and drained when the patient was almost moribund. No pus was found but the fluid from the wound contained streptococci in large numbers. Within twelve hours the patient's condition was much improved and thereafter he gained flesh and strength rapidly. All of the wounds healed well with the exception of the empyema where a long sinus persisted.

On September 20th a thoracoplasty according to Schede was done six ribs being removed. The patient made an excellent recovery from the operation and was discharged from the hospital with a healed wound on November 5th.

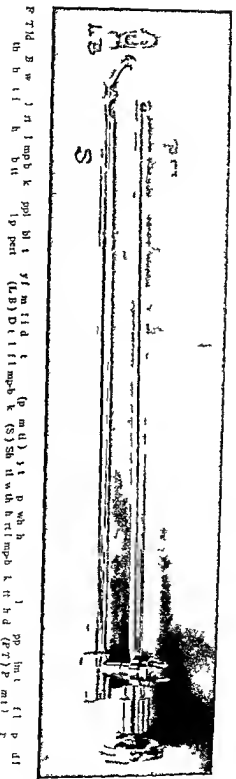
UNILATERAL RENAL HAEMATURIA DUE TO PYELITIS  
CYSTICA

DR IRVING S HAYNES read a paper with the above title, for which see page 417

DR F TILDEN BROWN said the case reported by Dr Haynes was certainly a novel one of hæmaturia. The clinical course of the case as well as the pathological findings suggested a hæmorrhagic condition of the pelvis of the kidney, but we should bear in mind that not a few of these rare cases of reported pyelitis cystica were associated with a corresponding condition in the ureter, where a considerable amount of the bleeding might have its origin. If the hæmorrhage in such a case was grave enough to threaten life, Dr Brown said he would concur with the reader of the paper that a nephrectomy was the proper procedure, but if, on the other hand, the hæmaturia was not grave, it would perhaps be advisable to do everything to save the kidney, for the reason that in 50 per cent of these cases the condition was shown to be bilateral, even when ureteral catheterization failed to afford evidence of the fact, which need not excite surprise since the bleeding on either or both sides may temporarily cease.

Dr Brown said that from the fact that a perineal operation for access to the bladder was done by the reader of this paper as a preliminary step, some of the patient's symptoms were probably referable to this viscus. The speaker desired to be corrected in regard to his understanding or misunderstanding of the reader's definition of pyelitis cystica as being a condition of the mucosa of the renal pelvis similar to that of the bladder during a cystitis. The speaker supposed that the adjective cystica had reference to a not necessarily acute inflammatory process but rather the reverse, where by some unknown reason the epithelial lining was raised by serum to form numerous small discrete vesicles, blebs or cysts. The speaker recalled twenty years ago a case of his own of hæmorrhagic pyelitis in a pregnant young woman from whom, after many days of persistent and excessive bleeding, Dr McBurney found it necessary to remove the kidney to preserve life.

DR HAYNES, in closing, said the picture he intended to convey by the term "pyelitis cystica" was one that represented the same changes that occurred in chronic cystitis of the bladder. The bladder showed evidences of chronic cystitis, and for that



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reason he had drained it. The opposite kidney so far as could be ascertained was normal. The speaker said he appreciated the fact that the removal of a kidney of this kind was a serious problem still this patient had had the trouble for a considerable time and was anxious to be relieved and nothing short of a nephrectomy was positive in its results.

#### AN IMPROVED CONSTRUCTIONAL DETAIL IN THE CYSTOSCOPE

DR F TILDEN BROWN showed a cystoscope in this instance fitted to the W K Otis examining cystoscope characterized by a new and shorter elbow for effecting the junction of beak and shaft a feature which he believes will at once prove of considerable advantage and beneficial adaptation to all cystoscopes especially those of the prismatic or indirect vision type (Fig 1)

This new technical detail in the construction of cystoscopes and one which Dr Brown wishes to place on record will afford the following advantages. First a closer approximation of lamp and lens consequently a better illumination of the field. Secondly a shorter beak and for that reason one more easily passed to the bladder. Thirdly a moderately curved heel in place of an acutely angled one which also facilitates introduction.

# TRANSACTIONS

OF THE

## PHILADELPHIA ACADEMY OF SURGERY.

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*Stated Meeting held December 2, 1907*

The President, JOHN B ROBERTS, M D, in the Chair

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### MELANOTIC SARCOMA OF THE SHOULDER

DR JOHN H GIBBON exhibited a case of melanotic sarcoma of the shoulder and showed photographs of the patient before operation. The patient was a child of eight years of age, upon whom Dr Gibbon operated last March. She had a large melanotic growth involving the skin over the shoulder and back. There was also a metastasis to the axillary glands. Numerous melanotic spots were observed in the skin all over the body and face. The growth was removed, together with the glands. Several skin grafting operations were subsequently performed. The wound is now all healed excepting an area about the size of a dime. The child has put on weight, and looks and seems perfectly well. There has been an increase, however, in the number of black spots in the skin. The clinical diagnosis was melanotic sarcoma and this was confirmed with the microscope.

### FALSE ANEURISM OF THE FEMORAL ARTERY

DR GIBBON also exhibited a man with a large swelling in the lower third of the thigh, this man had been shot through the thigh twenty years previous. From the history it seemed that he had developed some years later an aneurysm in the neighborhood of Hunter's canal. Last February the swelling became much larger and has recently gradually increased, until it reached its present proportions. A bruit can be heard over the inner aspect of the tumor, but nothing can be heard over the outer portion of it. It extends across the posterior and two lateral aspects of the lower portion of the thigh. The veins over it

are very much dilated There was a question whether this was a pulsating sarcoma or whether it was a ruptured aneurysm Dr Gibbon was inclined to think it was the latter condition

(The patient has since been operated upon and a large false aneurysm due to gunshot injury of the vessel was found A Matas operation was done and several portions of the bullet and spicules of bone were found embedded in the vessel wall The patient is making a good recovery )

DR J CHALMERS DA COSTA stated that on examining this patient he had thought the condition was an aneurism the result of injury in Hunters canal and that its situation had made the development slow The fact which particularly attracted his attention was the sudden increase in size of the swelling which the patient stated had occurred in a single night Since then the swelling has progressed slowly

DR OSCAR H ALLIS said that he had had a case somewhat similar to the one exhibited at the Presbyterian Hospital and that the bruit was so distinct in the popliteal space that everyone who examined the case regarded it as one of aneurism but it was shown to Dr Samuel W Gross and he immediately said it was not an aneurism and it was later proved that it was sarcoma

### ENCHONDROMA OF CLAVICLE

DR GIBBON also exhibited a specimen of enchondroma of the clavicle This growth which was larger than two fists was attached along the outer one third of the posterior border The tumor had grown down underneath the clavicle and underneath the scapula it also filled the supraspinous fossa and covered the spine of the scapula and came forward over the clavicle Because of its slow growth it was supposed to be an osteoma or enchondroma but it was feared that a sarcomatous change might have taken place The patient was an adult aged 49 The clavicle and scapula constricted the tumor in its centre giving it the appearance of an hourglass and rendering its removal very difficult

### GUNSHOT WOUND OF BRAIN

DR J CHALMERS DA COSTA reported a case of gun hot wound of the brain The patient was 50 years of age Six months before Dr Da Costa first saw him he had attempted suicide by shooting himself in the head The weapon was a



revolver the calibre of which was No 22 He shot himself back of the right ear and the bullet did not emerge He is said to have been unconscious for hours after the infliction of the injury He gradually recovered from the coma but was found to have almost complete amnesia He remembered his name and had some hazy knowledge of his life before he shot himself, but had no knowledge whatever of recent events and no memory of the suicidal attempt Shortly after the accident he developed epileptiform attacks in each of which there was complete unconsciousness for a brief period and irregular generalized muscular spasm The epileptiform attacks were occasional and irregular On entering the hospital it was found that there were no distinct sensory phenomena, that the eye grounds were normal, and that the epileptiform seizures did not have a local beginning Amnesia was complete as to all events subsequent to the injury and to most events before it The registration element of memory was completely destroyed and the reproductive element was sadly impaired Dr Manges, by the X-rays, located the bullet beneath the parietal eminence of the left side The patient was showed to the clinic as a case in which a bullet had crossed the brain and lodged beneath the cortex of the site opposite to the entry A diagnosis of subcortical left-sided lesion was made That very afternoon he developed status epilepticus of great violence His life was thought to be in imminent peril and he was trephined over the supposed point of low gunshot The dura was normal and when it was opened the cortex appeared normal The cortex was incised and at a depth of one-fourth of an inch a cavity was entered The cavity contained some partly clotted blood and some fragments of brain substance adherent to fibrous tissue and to the the bullet The bullet was removed It was partly flattened and had a bit of fibrous tissue and some brain substance firmly adherent to it It seemed that the projectile had been encysted but had been detached from its encompassing wall A piece of gauze was inserted, the dura was sutured and the wound was closed

For some days he was very delirious but he gradually recovered and now is vastly better At this period (2 months after operation) his memory has notably improved and he remembers well all events antecedent to his suicidal attempt Registration is again taking place and he remembers things from day to day,

but has no memory whatever of the time between the shooting and the time at which he became fairly normal after the operation. Dr. Da Costa had hoped to have had him here at the meeting but his family had failed to bring him. The bullet was found in the exact position and at the exact depth indicated by Dr. Manges.

### GUNSHOT WOUND OF THE SPINAL CORD

DR. DA COSTA also reported a case of gunshot wound of the dural spine. This man had been shot by accident some weeks before. He had had a laminectomy performed upon him but the bullet was not found. On admission to the hospital it was found that he had the symptoms of a complete transverse lesion at the level of the third dural vertebra. Dr. Manges located the bullet with the X rays. He developed a fever due it was thought to cystitis. He died in a few days. The necropsy showed the bullet in the interior of the spinal cord. The cord was virtually destroyed at this level and the bullet could not be seen where the dura was opened. It could only be seen when the cord was incised. Dr. Da Costa exhibited the specimen and stated that it was no wonder that the bullet was not discovered by the surgeon who performed laminectomy.

### LOCALIZATION OF FOREIGN BODIES IN SKULL AND SPINAL COLUMN

DR. W. F. MANGES spoke as follows:

The apparatus used to determine the location of the bullet in each of the two cases reported by Dr. Da Costa is a modification of the Mackenzie Davidson cross thread localizer. It was devised by the Roentgen Mfg. Co. of Philadelphia and is a detachable part of the tube carriage of their radiographic table.

All parts of the tube carriage are accurately graduated and to the base of the tube holder are attached two spirit levels so that it is possible to manipulate the X ray tube in a definite and most precise manner.

The localizer has four adjustable rods three of which are used to bring the localizer in a definite relation to the patient and the fourth to point to the exact location of the foreign body in relation to the localizer. There is a cross bar deeply notched at intervals corresponding to graduations on the cross bar of the tube carriage.

A clamp to hold the sensitive plate in relation to the tube carriage is attached to the edge of the table, and a shadowgraph of this clamp makes it possible to bring the developed plate back to the position it occupied at the time of exposure

The relations, then, between the X-ray tube, the localizer, the patient, and the sensitive plate, are definite and can be manipulated with mechanical accuracy at will, and regained with equal precision after the exposures are made

The technique of localization by this method is briefly this The position of the bullet, or, other foreign body, is first approximately determined by means of the fluoroscope, or by making a skiagraph or two

A sensitive plate is then put on the table and held by the clamp above mentioned The patient is placed on the table so that the region containing the foreign body will be in the field of radiation, and that the desirable field of surgical operation will be directed towards the X-ray tube

The localizer is then attached to the tube carriage, the carriage brought to position, and lowered so that the localizer approaches near the skin surface, the three adjustable pointers are made to touch the surface of the body at convenient spots, and in this position they are firmly fixed, these spots are made indelible with silver nitrate, all readings of the tube carriage and the spirit level are carefully noted The localizer is then removed, the focus point of the X-ray tube (the source of light) is brought to a position which exactly corresponds to the position of one of the deep notches on the cross bar of the localizer, when it was in position, an exposure of but few seconds is made, the focus point of the tube is then made to correspond with the other deep notch on the cross bar of the localizer, and a second short exposure is made on the same sensitive plate

The patient is removed, and the plate is developed On the plate is then found two images, or shadows, of the foreign body and shadows of the two arms of the clamp which held the plate When the plate has become thoroughly dry a piece of thin white paper is pasted as its corners to the film on the plate, and tracings of the several shadows are made The plate with the tracings attached is then placed on the radiographic table in its original position with relation to the tube carriage and localizer, the tube carriage and localizer are also made to occupy their original posi-

tion so that the two deep notches on the cross bar of the localizer assume the exact positions of the focus point of the X ray tube at the time of exposure. A thread with a weight attached to one end is passed through one deep notch and the weight end placed on the centre of the shadow made with the tube in that position and a second similar thread is directed from the other notch to its corresponding shadow of the bullet. The point at which the threads cross is the location of the bullet in its relation to the localizer.

The fourth adjustable rod of the localizer is then placed in position so that its point touches the crossing of the threads in which position it is fixed except in the direction of its long axis and superficial to the location of the cross threads. At the time of operation for removal the localizer is sterilized and the radio-grapher observes the rules of surgical cleanliness so that he may adjust the localizer to the patient.

The three fixed points of the localizer are placed on their respective marks on the patient and then the fourth rod will point in the exact direction of the bullet and at the same time give the exact depth from that point of the surface which it touches.

If necessary at intervals during the operation the localizer may be reapplied to determine the depth of the wound and bullet.

Dr Manges claimed no part in the designing of the apparatus except the valuable addition of the spirit levels to the tube carriage but he believed that the idea of sterilizing the apparatus and taking it to the operating table originated in the X ray department of Jefferson Hospital and that it was first put into practice in one of Dr Da Costa's clinics during the winter of 1906-7. They had had its efficiency tested in five cases in all of which the results have been most satisfactory one of the cases having been determined on the postmortem table.

#### NAILING A RECENT INTRACAPSULAR FRACTURE OF THE FEMUR.

DR G G DAVIS said that a couple of years ago he showed a case before the Academy in which he had fastened the fragments together with a steel screw which was allowed to remain in for approximately four weeks. He considers it an interesting question as to whether or not to operate in cases of recent fracture. He believes that the case he refers to was the first to be reported

and he advocated that method of procedure, that is, operative treatment in a recent intracapsular fracture. He considers the question as to the propriety of operative interference now lies in our estimate of the value of conservative measures. There are two ways of treating intracapsular fractures which have proven very successful, one, in which there is longitudinal traction together with lateral traction, the other is in the position of forced abduction. The question hinges upon the desirability of introducing foreign bodies into these bones on account of the danger of sepsis. He said that Dr. Da Costa would recall a case which he had him see several years ago, where there were beautiful symptoms of active sepsis, evidently caused by steel pins driven into an old ununited fracture, and since then Dr. Davis has had other cases in which it has been desirable to remove the pins. In one case where he tried using ivory pins, these pins broke and therefore in some of his recent cases, instead of using pins or screws to fix the fragments he has resorted to placing the limb in very marked abduction in plaster-of-Paris. Most of his cases have been those of ununited intracapsular fracture, but the union has been so prompt that he is growing sceptical regarding the necessity of using pins or other means of fixation by foreign bodies in these cases of intracapsular fracture. In justice, however, he states that he has seen one case in which this method of abduction was tried in a recent fracture but union did not occur.

DR. H. AUGUSTUS WILSON said with regard to the disadvantage of driving the spike through the head of the acetabulum, that he considered that this was a proper mechanical procedure, for if the point of the spike went simply into the head it would have little opportunity of holding the head of the femur at the point of fracture. In one of his own cases he also drove the nail through the head into the acetabulum, and yet in two years' time there was perfect bony union, there was some restraint, however, to rotation, abduction and adduction, in which positions the point of the spike in the cavity in the acetabulum prevented these functions. Flexion was unimpaired. It seemed as though there were strong indications for the removal of the nail, but the patient was so well satisfied with the firm union that she declined to have the nail removed. The kind of nail used is of great interest. Nicolaysen drove in a steel nail, making no skin incision

and without anesthesia driving the nail into position through the skin leaving the head outside. In 21 cases he removed the nail in three weeks time and he states that in every case the nail was found loose. Since that time large numbers of various materials have been used and in all cases where steel nails have been used the nails have had to be withdrawn. Being impressed with the fact that the nails were always found loose Dr. Wilson resorted to a method of barbing the nails. He has coin silver nails prepared in such a way as to make their entrance easy and their removal difficult. In one case this was found of decided advantage in that it held the nail fixedly in position and an X ray taken two years after the insertion of the nail showed it in the original position. This method also got rid of the objection of drilling beforehand.

With regard to the old idea that old ununited fractures must have the edges freshened before they will unite Dr. Wilson stated that in the January 1908 number of the *American Journal of Orthopedic Surgery* he will make a report based upon the 35 cases on record. Comparatively few had the edges freshened yet union almost invariably occurred. He believes that Dr. Da Costa is the first to resort to nailing a recent intracapsular fracture as in all other cases reported considerable time had elapsed between the time of injury and that of operation.

DR. ROBERT G. LE CONTE wanted to know what practical value the nail could have if as stated it became loose a few weeks after its introduction. He thought its use might in a way explain the treatment of Bier for delayed union viz. that it produces enough irritation and exudation of blood around the fracture as to be the cause of the union and that the success of the operation depends on this and not the fixation of the fragments by the nail.

DR. OSCAR H. ALLIS said that the loosening of the nails was due to a certain inflammatory process by which they are absorbed and that a nail as well as a screw acts as a foreign body. He believes that he was the first to put in an ordinary carpenter's screw in a fracture and with only one exception has he ever had to search for the screw. After leaving it in for about six weeks it is almost ready to be picked out with the finger. In one case of fracture of the femur between the junction of the middle and upper third he turned the patient on the belly and cut right down on the posterior aspect of the thigh and in that

way he had absolutely perfect drainage. In this case, when he was ready to take out the screw, he found the wound entirely closed, and he believes that if the patient is still living she still carries the screw with her. Dr. Allis believes that in some instances the nail or screw acts as a dentist's plug in a tooth.

Dr. Allis stated that the cancellous structure of the head of the bone is very much firmer and closer than in other parts. He believes oftentimes the good done by the nail or screw is in the presence of a foreign body.

#### RECONSTRUCTIVE ENDOANEURYSMORRHAPHY

DR. FRANCIS T. STEWART reported the case of I. C., colored, laborer, aged 36, who was admitted to the Pennsylvania Hospital June 1, 1907, in the service of Dr. Le Conte, who assisted in the operation. Nine years ago he acquired syphilis, but otherwise has been in good health. About four months before admission he developed a painful swelling in the right popliteal space. He had received no injury, but just before this time he had slept, on one occasion, with the affected leg hanging over the edge of his bed. Examination revealed a swelling about 4 inches long and 2 inches wide in the right popliteal space, giving all the intrinsic signs of an aneurysm. The knee was slightly flexed, the tibial vessels pulseless, and the leg free from swelling but the seat of severe pain. General examination revealed nothing abnormal except slight atheroma of the arteries. After exsanguinating the limb and applying an Esmarch band the swelling was exposed by a longitudinal incision, the internal popliteal nerve, which was stretched over the sac, drawn to one side, and the sac opened. The aneurysm contained a large quantity of clot, which was soft and black in the middle, and white, tough and cribriform on the walls. The aneurysm had grown at the expense of the postero-internal wall of the artery, and the antero-external half being represented by a groove two inches long. A catheter was placed in this groove and the walls of the aneurysm approximated above it with catgut sutures, the catheter being removed before the last stitches were tied. One small collateral opening in the sac also was sutured. The sac was then obliterated by approximating its walls as described by Matas and the skin sutured without drainage. Immediately after the operation feeble pulsation could be felt in both tibial vessels, which became

stronger with the lapse of time. There was no bleeding during or after the operation. The leg was dressed on the twelfth day the stitches removed and healing found to be complete. The patient could extend and use his limb as freely as before the development of the aneurysm but complained of the same severe pain as before the operation. Some weeks after leaving the hospital he returned with a lacerated hand. Because of the pain a splint had been applied to the leg at another hospital and this had caused ulceration near the heel otherwise the leg was in the same condition as at the time of discharge.

That the Matas obliterative operation is superior to all other forms of treatment in cases in which it is applicable seems at least in this country to be generally admitted. The only possible disadvantage as compared with extirpation of which we can think is that in cases in which the nerves are encompassed by inflammatory tissue or incorporated in the sac wall the motor sensory or trophic symptoms may not be relieved. There is doubt however in the minds of many surgeons as to the advisability of the reconstructive operation. Excluding secondary hemorrhage which in the absence of sepsis need not be feared there are two reasons for this viz thrombosis at the seat of operation and recurrence of the aneurysm. Occlusion of the newly made vessel by thrombosis has probably followed most of the reconstructive operations. In our case the pulse in the leg reappeared immediately after the operation and persisted. It is possible that although the first pulsations in the tibial vessels were due to blood flowing through the repaired artery this soon became occluded and that the pulse persisted because of the development of a collateral circulation aided by the removal of the pressure of the aneurysm from some of the collateral vessels. With however the application of the principles of modern vessel suture *ie* fine needles fine threads close sutures and the minimum of trauma thrombotic occlusion should be less frequent. If it does occur it may do so slowly enough to allow an efficient collateral circulation to form but even though it occurs immediately the same result would be obtained as in obliterative endoaneurymorrhaphy. Recurrence of the aneurysm is the strongest objection to the reconstructive operation as it has occurred twice in 16 cases. These figures do not include arteriorrhaphy for recent aneurysms following wounds of healthy arteries in which there



is no question as to the best treatment. They do, however, include the Matas restorative operations, as there is no essential difference between these and those of the reconstructive variety, except the size of the opening and consequently the number of sutures applied. As Binnie has pointed out, the aneurysm which Matas calls fusiform is in reality a sacculated aneurysm whose mouth has extended for some distance along one side of the artery. No doubt with improved technic and larger statistics recurrence will be less frequent. A recurrence of course leaves the patient no worse than he was before and may be dealt with by any of the methods applicable to a primary aneurysm. As gangrene is inevitable in a certain proportion of all operations interrupting the circulation in the main artery of a limb, we believe that despite the possibility of recurrence, the reconstructive operation should be encouraged.

DR J CHALMERS DA COSTA said that he had never done the reconstructive operation for aneurysm, but that he had done the obliterative, and in his case had found it impossible to use very fine needles. In this case there was a thick, tense sac and large needles had to be used. He obliterated the sac but could not completely close it, and had to pack gauze down upon it, and the result was a large cicatricial mass in the popliteal space which caused partial flexion of the leg. A number of months passed before it was possible to get the leg straight again. He believes the old Hunterian ligation still has a place.

#### RUPTURE OF THE LUNG WITHOUT COSTAL INJURY

DR R G LE CONTE read a paper with the above title, for which see page 383.

DR OSCAR H ALLIS considered that the mechanism of the lung might be explained as in the mechanism of a lacerated intestine, such laceration depends on the condition of the intestine at the time of injury, whether full or not, and if laceration occurs it will be at the point where the mesentery is shortest. With regard to the lung, this organ is never seen at postmortem in its normal condition, it is heavier under ordinary circumstances than at post-mortem. Hence, it seems there might be enough weight to tear it entirely away. Dr Allis considers this adds another argument with regard to the mechanism of that lesion.

DR ASTLEY P C ASHHURST said that it might be of interest

to know that about one sixth of the cases of rupture of the lung without injury of the thoracic parietes have been reported by Philadelphians. In 1871 (Trans Path Soc Phila) his father had collected 20 such cases 14 of which are not included among the 20 instances of this injury recently analyzed by Schwartz and Dreyfus [Revue de Chir 1907]. If these tables be combined and there be added to them the cases reported by Le Conte and by Stewart as well as a second case reported in 1894 by Prof Ashhurst there would be 47 cases in all 33 of the patients recovering. Dr Ashhurst does not believe the mortality rate has been altered in recent cases as practically no changes have been introduced in the treatment. He said that there had been a number of cases of traumatic rupture of the diaphragm reported where laparotomy was done but that in these cases the mortality rate was high. Mortality after a thoracotomy however he states is very much less than after abdominal section for all forms of diaphragmatic hernia and thoracotomy is also a much easier operation especially for stab wounds and traumatic rupture of the diaphragm.

#### DOUBLE FACED SURGICAL ADHESIVE PLASTER.

DR CHARLES LESTER LEONARD presented samples of a double faced adhesive plaster. This plaster has a double coating. On one side zinc oxide and on the other plain rubber adhesive. Thus the plaster can be applied directly to the skin and covered with a bandage or can be made to hold the initial end of the bandage in place. It can also be utilized to hold compresses and splints in place insuring absolute fixation in their original position. Applied in strips between the layers of bandage it adheres to both fixing them intimately together preventing any displacement and increasing their rigidity and consequently the support obtained for the parts. It is very serviceable neat and effective as a method of fixing the loose end of any bandage a transverse strip the width of the bandage in length beneath the end holding it firmly and neatly in position a very desirable result especially in dressings on the head and face. Local dressings as in boils abscesses or ulcers can be held in place by strips concealed beneath the final layer of gauze.

Other application of this form of surgical adhesive plaster will readily suggest themselves to the surgeon when employing

it in practical work, where it will be found particularly useful in fixing dressings, pads or splints to the skin

Its only use has heretofore been in the retention of wigs and toupes and has not been utilized in surgical dressings or previously made in a form suitable for surgical application

It is now manufactured in five yard rolls one inch, one-half and one-fourth inch wide, and can be furnished, if desired, in sterile packages

## BOOK REVIEWS

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THE TREATMENT OF FRACTURES By CHARLES L. SCUDDER  
M D Surgeon to the Massachusetts General Hospital Lec-  
turer on Surgery in the Harvard University Medical School  
Sixth edition thoroughly revised and enlarged with 856  
illustrations Philadelphia and London W B Saunders  
Company 1907

Six editions of this work attest the popularity the former ones have met with In the present one the author has amplified the text with new illustrations and extracts from the most recent contemporary literature

Dr Scudder advocates the more general employment of anesthesia in the examination and the initial treatment of fractures especially of those near or involving joints and this in conjunction with the accurate knowledge of conditions derivable from the use of the Rontgen ray tends to a greater simplicity of treatment and the abandonment of many of the older and more complicated mechanical devices we notice that the book is not encumbered with many at best archaic and unnecessary appliances

Theories of treatment are not discussed but the thought and anatomical knowledge of the examiner is brought to bear directly on the actual conditions which are found in each individual case of fracture Mechanical simplicity is always the thing to be attained We concur most emphatically in the author's plea for the frequent inspection of fractures a fresh application of the dressing and re adaptation of the splints this point can never be too forcibly emphasized

The newer nomenclature of closed and open fractures instead of the misleading and frequently misused terms simple and compound fractures is used The more uncommon fractures are not considered Surgical intervention in the case of certain fractures is discussed at some length in this edition and a few operative procedures have been described Remote results following trauma to the head have also received deserved attention

The author has developed certain chapters and introduced new ones devoted to obstetrical fractures of the new-born, to fractures of the zygoma, of the malar bone, of the superior maxilla, of the head and neck of the radius, of the neck of the femur, and to the carpal scaphoid, to unreduced dislocations of the elbow, to acromio-clavicular dislocations, to pathological fractures, to old fractures of the radius, and to Volkmann's contracture

The work takes up systematically the regions and their bones. In addition to this ordinary classification, there are introduced sections on anatomical facts regarding the epiphyses, gunshot fractures and their treatment, the Rontgen ray and its relation to fractures, the employment of plaster of Paris, the ambulatory treatment of fractures, and notes of the more common dislocations

JAMES TAFT PILCHER

## CORRESPONDENCE

### THE BOTTLE OPERATION FOR HYDROCELE

EDITOR ANNALS OF SURGERY

In the December 1907 number of the ANNALS OF SURGERY Dr E. Wallace Andrews describes a new method for the radical cure of hydrocele which he calls the Bottle operation. This operation was described by Doyen in 1895 though conceived in 1890 he required but three to five minutes for its performance (*Archiv Prov de Chir* 1895 vol 4 p 706)

In India it is known as Pritt's operation (Tandau Brit M J Apr 22 1905 p 88). His description is found in the *Indian Medical Gazette* August 1898 page 287. It was reserved for hydroceles not larger than a coconut—in the enormous ones sometimes seen he thought it best to first remove part of the sac a year later however (*Indian Medical Gazette* April 1899 page 116) as a result of an experience with it in 18 cases he withdrew this restriction finding removal of the sac unnecessary in even the largest hydroceles—the size of a football.

Longuet (*Presse Medicale* Paris Oct 31 1900 p 309) describes what he regards as a modification of the operation the time for its performance being reduced to one minute and the patient being about his usual duties the next day. With a little practice he says C'est un escamotage.

The following are further references to this operation

Winkelmann *Centr f Chir* No 41 1898 vol 23 p 109

William *Polyclinique (Paris)* Mch 15 1900 p 84

Niblock *Indian Med Gaz* Mch 1902 p 11

Gaynes Doyle *Brit Med J* Jan 8 1905 p 184

Legue *Rev de Chir* 1899 p 601

Chandeze *Archiv de Med et de Pharm Milit* 1903 p 193

Hande Paris Thesis 1900

Gambier Paris Thesis 1901

B A Heymann *Ein Beitrag zur Radikaloperation der Hydrozele* 1904

Griefwald

FRANK P VALE M D  
Washington D C

## EDITOR ANNALS OF SURGERY

I am greatly interested and gratified to learn from Dr Vale's references that Dr Pratt of India anticipated me by eight and a half years in the publication of a stitchless method for eversion of the sac in hydrocele I seldom see the East Indian journals and it seems to me that too little interest and recognition has been accorded the original work of Indian and Australian surgeons in Europe and America I should like to see the method called "Pratt's operation" if it is to have a name at all

Of course the French surgeons first devised and published the eversion method (method 3 in my paper) I should never see the fairness of calling this technique Winkelmann's operation, as is done in Germany, unless credit for original work is to be circumscribed by boundaries of race and language It will be seen from the bibliography given above that Winkelmann is several years behind the French in date of publication

He had not reached the stage of discarding stitches (which constitutes the "bottle operation") but advises that the slit in the sac be "*so weit durch eine Knapfnaht verkleinert dass eine Wiederdurchtritt nicht mehr m6glich ist*" (Centr f Chir, 1898, Bd xxv, s 1092)

Since writing the paper on the "bottle operation" last July I have had a number of additional cases My own experience, as well as that of Dr Bevan and several Chicago operators, is that it is a surprisingly quick, easy and bloodless method of cure, well suited to local anesthesia

E WYLLYS ANDREWS

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# ANNALS OF SURGERY

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## ORIGINAL MEMOIRS

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### THE DIRECTION OF THE JEJUNUM IN THE OPERATION OF GASTRO ENTEROSTOMY

BY B G A MOYNIHAN MS FRCS

OF LEEDS ENGLAND.

THE operation of gastro-enterostomy has undergone a considerable number of alterations since the day on which Nicoladoni first suggested its performance to von Wolfier. There is a general agreement it would now appear among all surgeons that the posterior operation is preferable to the anterior chiefly because it allows of the opening being made into the jejunum close to the duodeno-jejunal flexure so that the loop the cause of such various complications may be avoided. But it is not yet decided as to whether it is better to attach the jejunum to the stomach in such manner that the opening shall be with its long axis vertical or inclined from above downwards to one side or the other. In the early descriptions I gave of the technique of this operation I suggested that the jejunum should be attached to the stomach along a line obliquely downwards and to the right. By degrees I came to make the opening more and more vertical until now it is usually as nearly vertical as I am able to make it with an inclination when there is one slightly downwards and to the right. In my own hands this operation has given most excellent results. Vomiting either immediately after or at some long time after the operation has been conspicuously



absent The regurgitation of bile has not been encountered in at least 200 cases dealt with by this method So much has it been lost sight of that those who have followed my work in recent times have had no experience of it But this has not been repeated in the practice of others who have carried out what was intended to be an exactly similar procedure Dr W J Mayo and Dr Munro of Boston, to name two of the most expert surgeons in gastric diseases, both met with occasional instances of bilious vomiting To endeavor to find a better method, one in which this tendency to the regurgitation of bile should be eliminated Dr W J Mayo (*ANNALS OF SURGERY*, 1906, 1, 537) suggested that the jejunum should be applied with its long axis lying from above downwards and to the left He pointed out that the jejunum on leaving the flexure passed to the left and backwards to the kidney pouch, when, therefore, the attachment of the bowel to the stomach was made along the line I had indicated a displacement occurred, which might result in a kink of the gut either at the flexure, or at the upper part of the union with the stomach Though I did not, for reasons which I will presently set forth, agree with the opinion of Dr Mayo, I felt disposed to perform some operations by the method he described The results were not by any means so satisfactory as those to which I had happily become accustomed In three cases in all I found that bilious vomiting occurred, in two of them it was slight, in the third it was considerable, bile was vomited in large quantities frequently This was indeed the worst case of regurgitation I had seen since the days of my very early experience The anastomosis was made in this instance as close to the flexure as possible, and it lay exactly along the line depicted by Dr Mayo My experience of this untoward complication was not singular Mr Rutherford Morison had the like ill-fortune, and I have heard of others Clearly therefore there was some other factor than the mere direction of the jejunal attachment which must be held responsible And I was much puzzled to discover what it was Recently I had the opportunity of seeing the post-mortem

examination of the case in which regurgitant vomiting had occurred and it revealed the cause of the trouble. Death occurred with jaundice ascites and emaciation the cancer of the pylorus for which the original operation was performed having spread to the liver. When the parts were examined the jejunum was seen to be attached very close to the flexure along Mayo's line and from the anastomosis the gut passed downwards and to the left into the kidney pouch it was free from adhesions throughout. But between the flexure and the anastomosis a distinct twist was seen in the jejunum. It was as though the bowel before being applied to the stomach had been rotated round its longitudinal axis. The amount of the twist was small but quite perceptible and it was of course more appreciable since it was confined to that portion of the gut just about one inch in length which lay between the flexure and the uppermost point of the sutured line. When the anastomosis was separated the opening in the jejunum was seen to be not exactly opposite the line of attachment of the mesentery. The rotation of the jejunum round its longitudinal axis the flexure of course being fixed had I make no doubt been ample to cause that partial obstruction of the gut that was responsible for the vomiting of bile. I think it more than probable that the same condition must have existed in those cases related by Dr Mayo and Dr Munro in which vomiting followed the application of the jejunum to the stomach along the line from above downwards and to the right.

In his paper Dr Mayo considers that the normal direction of the jejunum as it leaves the flexure is downwards and to the left to the kidney pouch. That the bowel lies often in this position when the parts are examined post mortem or when the abdomen is opened with the patient in the customary position during life is true. But seeing that the flexure lies to the left of the vertebral body it is into this position that the bowel would naturally fall. If however the patient's position be altered by turning him to one side or the other and the abdomen be then opened the jejunal direction will be found

to vary accordingly The attachment of the jejunum at the flexure is of such a nature as to allow it to go to left or right with equal ease, and with equal freedom from kinking at the meeting of the fixed end and the mobile parts The value of the little suspensory ligament or meso-colic band in preventing any kink is perhaps not inconsiderable That is, not improbably, its sole purpose To say that the jejunum takes a certain line "normally" from the flexure is therefore probably neither accurate, nor reasonable Its direction varies in accordance with the position of the individual, and in each position there is an easy transmission of fluid along its lumen Were it not so we might suffer high intestinal obstruction as a result of sleeping on the right side at night It is, of course, not very infrequent to find the jejunum pulled over to the right either by a long meso-colic band, or by adhesions between the jejunum and the transverse meso-colon So far as my own experience goes, when the jejunum is adherent to the meso-colon it is always fixed on the right of the flexure and never on the left If then any position may be assumed by the first few inches of the jejunum the mere direction of the line of attachment of the jejunum to the stomach is probably not the point of chiefest consequence in gastro-enterostomy And I have no doubt that every surgeon has at times made an anastomosis with whose appearance he has been considerably displeased, and he has feared that troubles would ensue This has, not once only, been my experience after the operation of partial gastrectomy That the line of union which points from above downwards and to the right may be followed, in a long series of cases in succession without the slightest mishap my own cases show That the line almost at right angles to this may be equally successful Dr Mayo has proved I suggest therefore that, as one might naturally suppose, one line is probably as good as another or any line between them as good as either, provided always that no twist be given to the gut at the time the anastomosis is made Just as there is no "natural direction" of the jejunum, so there is no "best line" for the anastomosis, so far at least as the

mechanics of the operation are concerned. But my own choice for some time past now has been in favor of the vertical line and since many of us spend most of our time in positions other than the recumbent one this is probably the most frequent direction taken by the jejunum as it passes from its point of origin. The essential point it seems to me then is to choose not so much a special line upon the stomach along which the jejunum should be applied but to choose on the jejunum as close to the flexure as possible a line which can be directly approximated to the stomach without the gut being revolved around its longitudinal axis.

# TRANSFUSION AND ARTERIAL ANASTOMOSIS.\*

SOME EXPERIMENTS IN ARTERIAL ANASTOMOSIS AND A STUDY OF TRANSFUSION  
WITH PRESENTATION OF TWO CLINICAL CASES

BY REUBEN OTTENBERG M D,  
OF NEW YORK,  
Interne at the German Hospital of New York

THE brilliant experimental results of the past few years, in the anastomosis of blood vessels, are rapidly bringing this operation into the domain of practical surgery

In September, 1906, it occurred to the author that it ought to be possible to unite blood vessels by means of a rigid ring, in such a way as to bring intima into direct contact with intima, and leave no foreign body in the lumen. With this idea in view, in the course of five trials on the cadaver and eight animal experiments, he developed a satisfactory technique

Up to this time, he had been acquainted only with Carrel's articles on blood vessel suture. Now, a review of some experiments by Jaboulay,<sup>1</sup> led him to other references, and following up the literature of the subject, he found that the idea was not at all new, but had already been put in practice by a number of other experimenters

Nevertheless, the author desires to present these experiments, not because they represent any new achievement, but because the lessons he learned might be of value to others who desire to enter this new field of surgery

It was the experience thus gained, and an acquaintance with Crile's work on transfusion, that prompted the writer to perform direct transfusion when two desperate cases of anæmia presented themselves

Of the author's eight animal experiments, the first four are disregarded, as the method was still in a developmental stage. Although of the last four experiments, only one was

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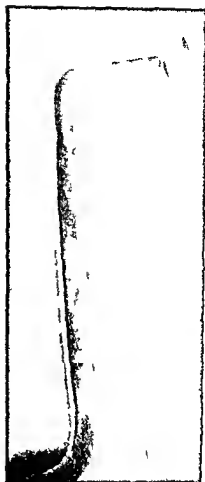
\* Jaeger prize essay for 1907, at the German Hospital, New York

<sup>1</sup> New York Medical Journal, Dec 22, 1906

a



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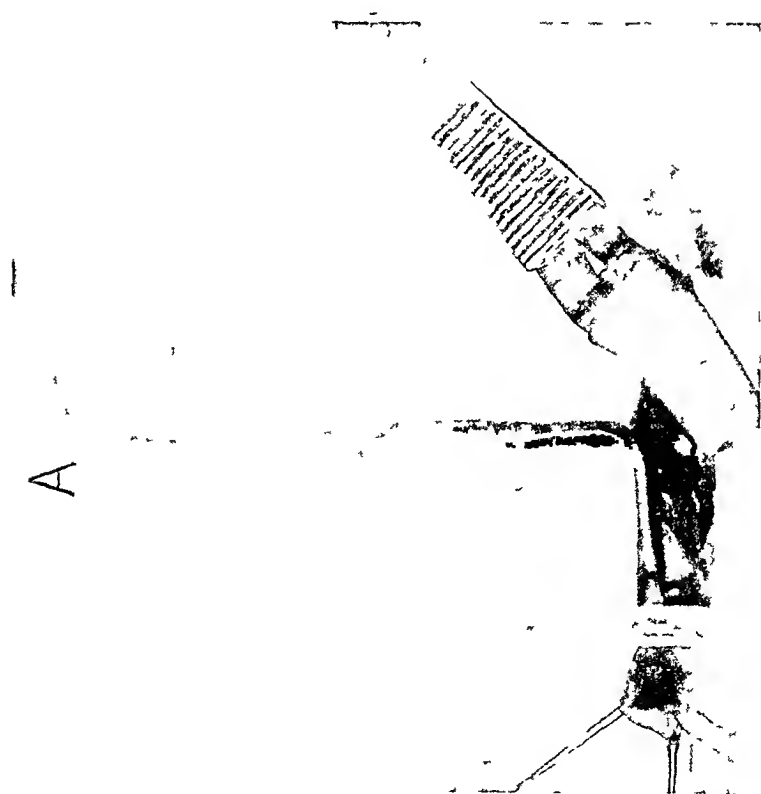
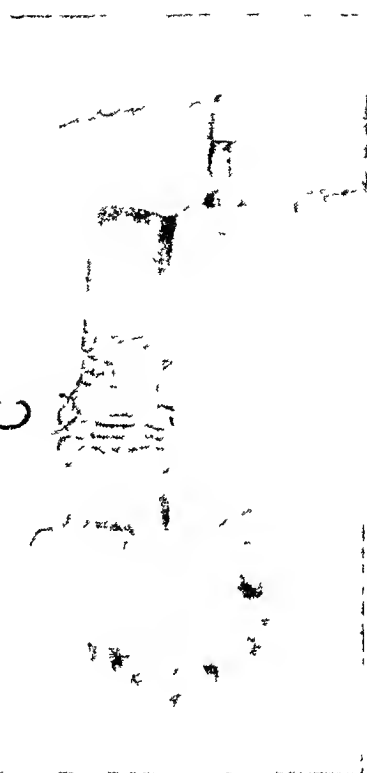


PLATE II — Technique of direct transfusions (A) Vessel isolated and threaded through ring, ready to make cuff (B) Cuff made, second vessel ready to be pulled over (C) Anastomosis completed, clamps not yet removed,

successful the three failures could be traced to very definite causes and the results should therefore be of value

The method (Plates I and II) is extremely simple. It consists in the use of a small silver ring whose surface has two grooves. The ring is held by a self retaining spring forceps which greatly facilitates the procedure.<sup>3</sup> The cut end of one of the divided vessels to be anastomosed is pushed through the ring and turned back over it like a cuff (see Plate II). This cuffing is very easily done if the open lip of the vessel is caught at three points in its periphery by three tension sutures of fine silk.

This cuff is then tied in place by a piece of fine silk in the posterior groove and the other vessel is pulled over it. Then at once the two vessels are fastened together intima to intima by two fine pieces of silver wire which fit into the two grooves. Silver wire is easy to put in place and is absolutely certain not to slip whereas silk which was tried in the preliminary experiments and which is recommended by previous writers slipped in two of those experiments.

There are several points in technique which though small are essential

1 The vessels must be handled with the greatest possible gentleness and must never be grasped with toothed forceps. Violation of this rule was the cause of failure in experiment No. 1 (*vide infra*). The best instrument for handling vessels is a fine bent forceps known to eye surgeons as curved foreign body forceps or blood clot forceps (see Plate 1 d).

2 The part to be cuffed back has to be prepared by carefully cleaning off adherent connective tissue. This is best done by pulling the connective tissue sheath over the cut end and snipping it off with scissors. On the end which is to surround the cuff it is best to leave considerable connective tissue

---

These rings were made for me by John Frick No. 8 Liberty Place New York

This clasp was made after the author's design out of one piece of one eighth inch steel wire by Mr. F. Foy former assistant engineer of the German Hospital



3 Throughout the procedure, the vessels must be kept moist with normal saline solution

4 About one inch of the vessel to be cuffed, and about one-half inch of the vessel to be pulled over the cuff, is all that one need expose. The part to be cuffed back is easier to manipulate if free from branches. If branches cannot be avoided, they must be tied close to the vessel, with fine silk.

5 The ring must be of exactly the right size, that is, its lumen must be just as large as the outer diameter of the vessel to be cuffed back, when full of blood. If one vessel is larger than the other, the ring should be put on the smaller of the two.

6 As in all plastic operations, there must be no tension (Tension was the cause of failure in one of the preliminary experiments.)

7 The part to be operated on, must, so far as possible be immobilized after operation. For this reason all experimenters on dogs report a far larger proportion of successes with the vessels of the neck and interior of the body, than with those of the extremities. (See experiment No. 4 below.)

8 The best means of temporary blood stasis is the use of Billroth's hare-lip clamps, well protected with soft rubber tubing (see figures).

9 Sometimes the muscular sheath of the vessel contracts so as to render the procedure difficult. When this occurs, the muscle may be made to relax by application of hot saline solution, or the lumen may be gently dilated with a small hemostatic forceps.

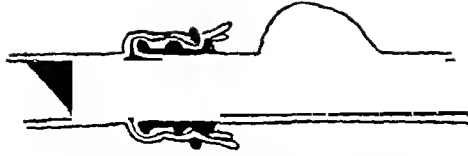
10 Absolute asepsis is essential.

*The first experiment*—Under ether, the right common carotid artery of a medium sized black dog was cut through and reunited. Only one silver wire ligature was placed around the ring.

Five and a half days later, a small hemorrhage was seen from the wound, (which had united by primary intention). After about eight hours the dog was narcotized, the anastomosis was exposed and removed. The point of anastomosis, itself, seemed in good condition, the ring was in place, and the wire had not cut through. About one-quarter inch to the cardiac side of the ring was a small rounded swelling, which

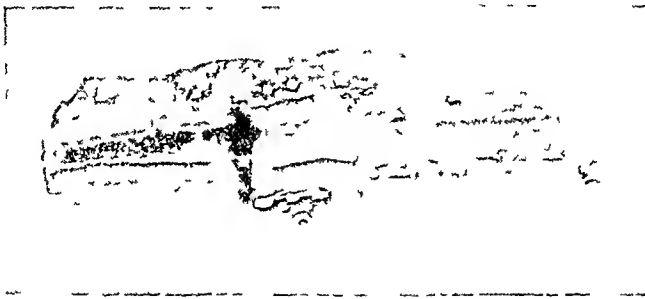


FIG 1



Ring anastomosis of carotid artery , traumatic aneurism in cardiac side of ring

FIG 2



Longitudinal section showing result obtained by ring anastomosis of carotid artery

FIG 3

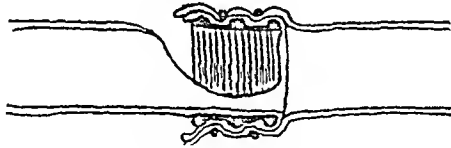
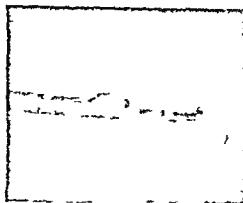


Diagram showing tear in wall of vessel from pressure of ring used in anastomosis of femoral artery

e



had ruptured at its apex (see diagram) and was filled with fresh clotted blood (Fig 1) This was evidently the source of the hemorrhage as no other source could be found This traumatic aneurism was undoubtedly caused by the mouse tooth forceps which were used in this experiment (but not in the later ones)

*The second experiment*—The right common carotid of a fair sized hound was cut through and re united a silver wire was placed over each of the two grooves

The wound healed and the dog remained in good condition. Three weeks later the dog was etherized and the anastomosis exposed. It was in perfect working order the pulse in the vessel was almost, but not quite as strong above the ring as below The entire vessel was surrounded by a dense mesh of connective tissue which buried it securely The segment of vessel was then removed and experiment No 3 was at once done on the same dog

The segment removed easily allowed water to be squirted through it but a day later as the result of hardening in formalin its lumen had so narrowed that a probe could not be passed through

On closer inspection after the specimen had been split longitudinally (see Fig 2) the lumen was seen to be clear but slightly contracted There was an exceedingly fine line of organized blood clot between the two intimas in the receding angle where they met The wires had shown no tendency to cut through The cuff and its envelope were losing their identity and becoming transformed into connective tissue

*The third experiment* illustrates the result of even slight infection — After the preceding specimen was taken out the right internal jugular vein was exposed through the same wound cut through and quickly anastomosed The largest ring at hand was about one-eighth inch too small for the vein but was used Toward the end of the operation several errors in asepsis were noted One week later the wound which had united was opened The vessel was found surrounded by a large pocket of serous exudate The lumen of the vein at the point of anastomosis was closed by a ragged thrombus

*The fourth experiment*—The right superficial femoral artery of a fair sized dog was cut through and re united The entire operation from the first incision to the last suture took forty five minutes

Five days later the dog was in good condition The pulse in the right dorsalis pedis was exactly as strong as in the left The dog was then allowed to run in the yard with the other dogs The next day there was a hemorrhage from the wound The dog had been very lively and had attempted to jump over the fence at some rabbits in the next enclosure On examination of the anastomosis two thirds of the circumference of the vessel appeared to have torn on the edge of the ring at the place where the cuff turned back (See diagram Fig 3)

The chief dangers to be feared then are hemorrhage thrombosis and narrowing

Hemorrhage ought never occur, provided that trauma to the vessel is avoided, and the part operated on is immobilized

The prime causes of thrombosis are injury of the intima and infection, and elimination of these causes is merely a matter of technique. Narrowing of the lumen (which occurred in experiment No. 2, and in Jensen's experiments), can be avoided by the use of the proper sized ring. For this purpose, it is advisable to have a series of rings, in diameter from two millimeters up, and differing by about a half millimeter.

One other danger might be thought of—the occurrence of pathological changes after a considerable time, as the result of the presence of a rigid foreign body, or as the result of the abnormal anatomical relationships of the structures of the vessel wall, at the site of anastomosis. Whether such changes would occur can, of course, only be definitely settled by prolonged observations. But there seems no reason to believe that such a foreign body, imbedded in the scar tissues around the healed vessel, would do any harm. In those of Hopfner's experiments, in which the magnesium rings were not found absorbed, they had done no injury at the end of eight weeks. Silver wire sutures have, of course, been known to stay in the body for years. For these reasons it does not, at present, seem essential that absorbable materials be used.

The use of a ring external to the vessels, in blood vessel anastomosis, was first suggested by Nitze, at the International Medical Congress, at Moscow, in 1897.<sup>4</sup>

The first actual experiments on record were done by Payr,<sup>5</sup> in 1900, and the method is generally known by his name. He used rings of magnesium (which is very slowly absorbable in the body), and had very good results. Though he did a large number of experiments, he did not give the details of them. Later, he reported one operation on the femoral vein of a man. The vessel was patent three days later when the patient died of pneumonia.

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<sup>4</sup> *Centralblatt f. Chirurgie*, 1897, p. 1042.

<sup>5</sup> *Archiv f. klin. Chirurgie*, lxxi, 1900, p. 67, lxxiv, 1901, p. 726, lxxii, 1904, p. 32.

Jensen<sup>6</sup> in 1903 experimented with several methods. His results were slightly in favor of suture methods and may be summarized as follows —

With Arteries

	Bone Protheses	Suture.
Perfect Result.		Two Cases
Narrowing	Three Cases	Three Cases
Thrombosis		Seven Cases

With Veins

	Various Protheses	Suture
Perfect Result		One Case.
Narrowing	Two Cases	Two Cases
Thrombosis	Eight Cases	Four Cases

Jensen's results so far as the ring method is concerned are not conclusive because he experimented with many different varieties of rings.

The most extensive work with magnesium protheses (or rings) is that of Hopfner in von Bergmann's Clinic in 1903.<sup>7</sup> He used the method altogether twenty eight times in different experiments on dogs. Six were simple end-to-end anastomoses. Of these two thrombosed (both of them with two millimeter rings) while of the four successful cases two were with three and two with five millimeter rings. He also did six reversal or transplantation experiments with the carotid and femoral arteries. Of these four were successful two thrombosed on account of the small size of the vessels. His transplantation experiments with veins all failed. He concludes that the method is not applicable to vessels smaller than three millimeters in diameter.

That blood vessels can be permanently united by the ring method is undoubted. Whether this method presents any advantages excepting its simplicity over the suture methods is doubtful and remains to be determined by further work. The method has been little known and nobody but Hopfner and Payr has used it often enough to become expert at it. The

suture method, on the other hand, has been perfected by a long series of experiments, and the author has had the pleasure of witnessing the finished skill with which Dr Carrel performs his operations<sup>8</sup>

One thing, however, is certain,—that for the temporary anastomosis necessary in direct transfusion, the ling method, because of its simplicity, is the method of choice

*Clinical Experiences in Transfusion*—In October, 1907, the author had the opportunity to perform transfusion in two desperate cases of secondary anæmia. While the immediate results were very satisfactory, both cases terminated fatally from continuation of the original diseases

CASE I—The first case was one of hemorrhages of obscure etiology. The patient, a German girl of twenty-five years, a trapeze performer, was admitted to the German Hospital, on the medical service of Dr Morjé, Sept 26, 1907

Except that one of her sisters suffered from prolonged and profuse menstruation, there was no indication of any tendency to hemophilia in the family history. Her only previous illness was an attack of acute articular rheumatism, four years before her present trouble. Aside from rather frequent nosebleeds as a young girl, she had never suffered from bleeding of any kind. Her menstruation, which had begun at the age of twelve, was previously perfectly regular and normal, seldom lasted more than two days, and never was profuse. She had never been pregnant, and denied all venereal infection. Her illness dated back fourteen months, to an injury in a trapeze accident. She fell twenty-three meters into a net, and was unconscious, how long, she did not know. From that time on, she had had almost continual bleeding from the vagina. Four months before her admission to the hospital, a curettage had been performed. The bleeding had stopped for three weeks after this, and then had returned and continued. Aside from this, she had suffered, ever since the accident, from

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<sup>8</sup> A careful study of the suture of blood vessels, with special reference to Carrel's work, will be found in an article by Watts, in the Johns Hopkins Medical Bulletin, May, 1907. Watts gives a full Bibliography. Carrel first described his method in the "Lyon Medical," 1902, vol 1, p 859, and vol 11, p 114 and 153, and has published numerous articles since.

very frequent vomiting which generally came on ten or fifteen minutes after meals. The vomitus was food just eaten and mucus never blood. For two weeks before admission to the hospital she had suffered with severe dyspnoea, cardiac pain and palpitation and a bad cough (with small amounts of mucus sputum never blood) and her legs had become swollen.

Examination after admission showed a very anæmic girl with œdema of the face and legs. There were signs of a bronchitis and of well marked aortic and mitral insufficiency. The pulse approached the Corrigan type and the blood pressure was abnormally high (200 mm). She was bleeding from the vagina. The uterus was firm and freely movable and there was a tough cord like blood clot hanging from the cervix. Ovaries and tubes were normal. Urine examinations were negative and the blood examination showed a marked secondary anæmia (35 per cent hemoglobin, 2,350,000 red blood cells).

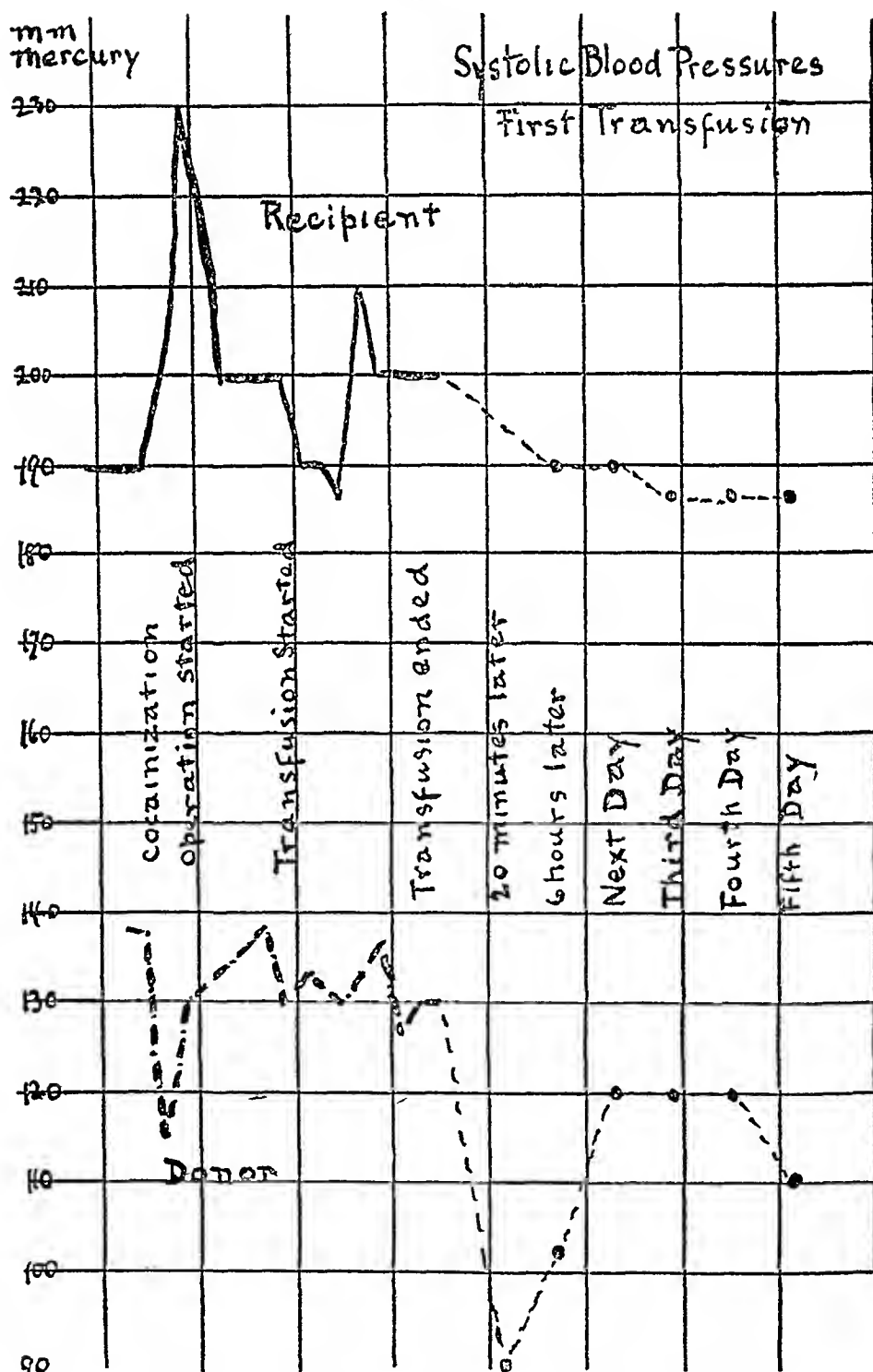
In spite of every variety of local and general treatment the bleeding continued, the vomiting became worse so that the patient had to be supported by hypodermoclysis and rectal feedings and the anæmia became more and more severe. On Oct. 11th the patient seemed to be in extremis. She had taken practically no food for several days and had signs of threatened œdema of the lungs. The hemoglobin had sunk to 15 per cent and there were only half a million red blood cells to the cubic millimeter.

On Oct. 12, 1907 transfusion was performed. The donor of blood was a healthy girl of twenty three years who was paid by the patient's friends. The patient and the girl lay on tables side by side, their heads in opposite directions. With the cooperation of Dr. F. Torek the left radial artery of the donor and the anterior ulnar vein of the patient were exposed and their central ends united by exactly the same technique described above for arterial anastomosis. Local anesthesia by Schleich's infiltration method was used. (The patient and the girl had had morphine before the operation.) Blood was flowing from the girl into the patient exactly twenty five minutes after the first incision.

As soon as the hare-lip clamps were taken off the vein was seen to distend with blood and could be felt to pulsate for several inches up the arm. The transfusion was allowed to continue for thirty five minutes. Then though both donor and donee were in excellent condition it was thought best following Crile's



PLATE III



Showing blood pressure in recipient and donor in Case I of transfusion

advice to stop Both vessels were then ligated the anastomosed segments of vessel cut out and the wounds closed by suture

During the course of the transfusion the condition of the patient improved visibly Her lips which had been pallid became red her breathing which had been labored became easier her mental condition changed from semi stupor to almost exhilaration her blood pressure which was observed every five minutes throughout the procedure did not on the whole show any marked rise—probably because it was already pathologically high (See accompanying chart)

The next day the vomiting which up to this time had been uncontrollable stopped Blood examination four hours after the transfusion showed a rise of the hemoglobin from 15 to 35 per cent and of the red blood cells from 600 000 to 1 096 000 per cubic millimeter

This increase continued steadily so that nine days later the hemoglobin was 45 per cent and the red blood cells 2 850 000 per cubic millimeter The explanation of this continued rise in the blood count after the transfusion is probably that the total volume of blood was then abnormally high and that in bringing the total volume back to normal the body simply got rid of the excessive fluid part so that the blood became more concentrated

In spite of this improvement in the general condition and in spite of every effort of the gynecologists to whose charge the patient was now transferred the bleeding from the uterus continued Very tight packing of the uterus checked the hemorrhage for only a short time Every other means for treating hemorrhage having been tried without effect it seemed that in extirpation of the uterus lay the only hope for the patient's life and accordingly on Oct 22nd ten days after the transfusion a hysterectomy was performed by Dr F Krug The uterus and adnexa removed showed no gross lesions

The loss of blood was slight and the patient stood the operation well but eight hours afterwards bleeding from the vaginal wound began and continued slowly but steadily until her death The day after the operation bleeding from the abdominal wound was noted the superficial part of the wound was opened by Dr Seeligman the blood clots removed and the wound sutured tightly again Bleeding from this source then ceased

Three days after the operation vomiting commenced again

## TRANSFUSION I BLOOD EXAMINATIONS OF PATIENT

To illustrate gradual rise in hemoglobin and red blood cells after transfusion

	September 27	October 8	October 12	October 12	October 13	October 15	October 17	October 19	October 21	October 30
			Before transfusion	4 hours after						(Day before death)
Hemoglobin	35%	20%	15%	35%	37%	45%	45%	40%	45%	25%
Red blood cells	2,350,000	560,000	600,000	1,096,000	2,064,000	1,744,000	2,220,000	1,840,000	2,850,000	1,500,000
Leucocytes	11,700	9,600	13,000	16,000		9,400			16,400	
Polynuclear	82%	79½%	88%	91%					83%	
Lymphocyte	14%	16%	10%	8%					13½%	
Mononuclear	1½%	3½%	½%	½%					1%	
Eosinophile	2½%	½%	½%	0%					2½%	
Basophile	0%	0%	1%	½%					0%	
		Microcytes Poikilo- cytes								
		No nucleated red blood cells								

and from this to the end the same pernicious type of vomiting persisted and as the patient was unable to retain rectal feedings she received practically no nourishment for the last seven days of her life. Thus probably more than the bleeding which was not profuse contributed to the fatal termination. For the last four days of her life the patient bled from her gums and the vomitus contained small amounts of blood (probably swallowed). All of the usual means of treating hemorrhagic conditions were of no avail.

At no time was there any evidence of lack of coagulability of the blood. There was no jaundice, no hemoglobinuria or other symptoms to point to hemolysis.

The patient died on Oct. 31st, nine days after the hysterectomy and nineteen days after the transfusion.

The effect on the girl who gave her blood to this patient should also be noticed. During the transfusion there was no visible change. Her pulse remained strong and slow and the blood pressure dropped only 12 mm (see chart). Twenty minutes after the end of the transfusion she suddenly became faint and pale, the blood pressure dropped 40 mm and the pulse rate slowed to 60.

This condition was transient but for six or eight hours the patient felt weak. She was able to sit up the next day and on the fifth day was discharged from the hospital none the worse for her experience. The change in her blood was small, the red blood cells dropping only from 3,400,000 to 3,000,000 per cubic millimeter and the hemoglobin from 80 to 72 per cent. She went about and attended to her business a week after the transfusion.

There was no data to determine the amount of blood lost. This could have been done either by weighing the donor or patient before and after the transfusion or as Watts suggests by cutting the vein at the termination of transfusion, measuring the amount of blood which flows from the artery through the anastomosis in a given number of seconds or minutes and from this calculating the amount which has flowed in the time taken by the transfusion. (This method it should be noted has the error of not taking into account the resistance offered by the venous pressure of the donee.)

The second case in which a transfusion was performed, presented, like the first, so many clinical aspects of interest, that it is hard to refrain from discussing the case in detail

CASE II —The patient, a Hungarian, married, 52 years old, and a civil engineer, was admitted to the surgical service of Dr Kiliani, Oct 12, 1907 The family and previous history can be disregarded The patient had never been ill in his life

For a year and a half he had been suffering, at intervals, with severe epigastric pains, and had been growing progressively weaker During this time he had lost about forty pounds For two months he had been vomiting frequently, generally at once after eating He had never noticed blood in the vomitus

The principal points in the physical examination were marked cachectic appearance and emaciation, Argyle-Robertson pupil, Romberg's symptom, and absence of knee jerks, signs of a chronic bronchitis and of arterio-sclerosis, scaphoid abdomen, with marked tenderness and an indistinct mass in the epigastrium

While in the hospital, the patient vomited, almost daily, large quantities (one to two pints) of altered blood The vomitus, unexpectedly, turned out to contain considerable amounts of free hydrochloric acid The stomach contents, too, after a test breakfast, showed free hydrochloric acid 45, total acidity 90 After the vomiting, the patient would feel much relieved for some hours, otherwise, he suffered from constant and severe pain, so that he had to be kept under the influence of opiates almost all the time

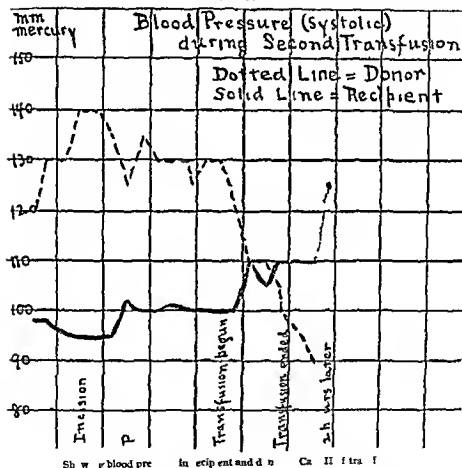
As a result of the constant vomiting of blood, the patient's general condition steadily deteriorated, the red blood cells sank from 2,480,000 to 1,300,000, and the hemoglobin to 20 per cent The diagnosis was in doubt Although the acidity of the stomach contents was high, the cachectic appearance and the history of the case, pointed to carcinoma, rather than ulcer, of the pylorus An exploratory laparotomy seemed indicated, but it was plain, that in the patient's weakened condition, any operation would mean death,—probably on the operating table

Under these circumstances, a transfusion was thought of, for the purpose of restoring the patient to an operable condition A ready donor was found in the patient's wife She was a healthy woman, but undersized, weighing only 90 pounds On

this account the transfusion from her was at first thought unwise. But as she insisted on taking the risk the operation was performed on Oct 28th at 10 30 A M.

The anastomosis was made by Dr Kiliani and the author in the same manner as in the preceding case. Blood was only allowed to run over from wife to husband for 17 minutes. At

PLATE IV



the end of that time the wife began to look pale and feel weak and it seemed best to stop.

Even during this short transfusion the general appearance and condition of the patient improved markedly—in fact much more than the increase of red blood cells to 1 772 000 immediately after as compared with 1 330 000 per cubic millimeter just before the transfusion would have led one to expect. The pulse

became stronger, and the blood pressure rose 10 mm during the transfusion (See chart) At the beginning of the transfusion the patient lay weak and depressed, comforted by his wife After it, the reverse was true, and the patient, whose spirits were almost buoyant, became the comforter (There is, no doubt, an element of suggestion in this marked mental change, which is described in nearly all cases of transfusion)

It was considered best to operate at once, before the patient could, by further hemorrhages, lose the blood thus given At two o'clock of the same day, an exploratory laparotomy was performed A tumor, involving the lesser curvature of the stomach, and adherent to liver and pancreas, was felt As the condition appeared to be a hopelessly inoperable carcinoma, the abdomen was closed at once After the operation, the patient gradually sank, and he died three days later of exhaustion

Post mortem, was found, near the pylorus, a large, round ulcer, in whose base was seen the patent blood vessel, from which the fatal hemorrhages had taken place The whole pyloric end of the stomach formed a greatly thickened and indurated mass of carcinoma, which was densely adherent to pancreas and liver

The wife suffered very little inconvenience, and was discharged from the hospital on the second day During the transfusion her blood pressure dropped 10 mm The red blood cells dropped only from 4,400,000 to 4,000,000 after the transfusion, and the change in the hemoglobin was not enough to be measured

The history of transfusion is a remarkable story of alternate enthusiasm and rejection It will only be briefly reviewed here<sup>9</sup>

Though there are many doubtful accounts, there is no clear evidence that any actual transfusion was tried before Harvey's discovery of the circulation of the blood, in 1628 Shortly after this, Christopher Wren<sup>10</sup> first conceived the idea of injections into blood vessels (infusion), and the first experimental transfusions were done on dogs by Richard Lower<sup>11</sup>

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<sup>9</sup> The history up to 1875, is fully given in Landois' "Die Transfusion des Blutes," Leipzig, 1875 Kohler, in "Gedenkschrift f d verstorben Generalstabsarzt v Leuthold," Berlin, 1906, p 269, brings the history to 1906, with certain omissions

<sup>10</sup> Philosophical Transactions, vol 1, 1665, p 128 (Landois)

<sup>11</sup> Philosophical Transactions, vol 1, 1666, p 352 (Landois)

The first transfusion on a human being was done by Jean Denis in France 1666 In the years following transfusion was tried everywhere with much eagerness and controversy Some of these transfusions were from animal to man others from man to man some of them were direct from vessel to vessel by means of a cannula but most of them were indirect i.e. some sort of pump or container was used Some successes were reported but there must have been many failures or fatalities because the procedure was dropped within a few years and hardly heard of again for over a century It was even forbidden by the French government<sup>1</sup>

In the beginning of the 19th Century transfusion was again taken up Blundell<sup>12</sup> reported seven cases of transfusion of human blood of which three ended in recovery Scheele<sup>14</sup> in 1802 and Diefenbach<sup>15</sup> in 1828 wrote extensive reviews of the subject Dumas and Prevost<sup>16</sup> first showed the injurious effect of the blood of one species on that of another and most of the transfusions of this period were from man to man Bischoff<sup>17</sup> about 1835 introduced defibrination Diefenbach<sup>18</sup> in his second work on transfusion in 1848 advised defibrination This method then became the established procedure and Panum<sup>19</sup> and Brown Sequard<sup>20</sup> as the result of numerous experiments both state that it is the main point in successful transfusion

In the middle of the century numerous scattered cases were reported and in 1863 Blasius<sup>21</sup> collected all the transfusions of the previous forty years—116 in all 56 with report of good results Of these all were indirect transfusions only two were from animals (both said to have been successful)

<sup>12</sup> Dorsett Interstate Med J 1906 p 217

Lancet vol 9 Oct. 18 5

Copenhagen 1802

Ueber die Transfus on des Blutes Be lin 18 8

<sup>14</sup> Ann de Chimie 1821 p 294

Muller's Archiv 1835

<sup>17</sup> Rust Handbuch der Chirurgie vol 1v

<sup>18</sup> V chow Archiv xxvii

<sup>20</sup> Journal de la Physiol 1858

<sup>21</sup> Deutsche Klinik 1863



and the fourteen cases with undefibrinated human blood, were unsuccessful. Some of the fatal accidents were attributed to air embolism. (Lowenthal<sup>22</sup> showed, in 1871, that small amounts of air in the circulation do no harm and are absorbed.)

For the twenty years between Blasius' publication and an important publication of von Bergmann's in 1884, transfusion was a subject of great popular interest as well as of much scientific controversy. Great things were expected of it, and all sorts of exaggerated claims made. It was recklessly tried, not only in anæmia, but in every form of disease. Emerson<sup>23</sup> in one of his essays, refers to it as "the boldest promiser of all,—the transfusion of the blood,—which, in Paris, it is claimed, enables a man to change his blood as often as his linen!"

New and complicated methods were devised, and many cases were described. In the Franco-Prussian war, thirty-seven transfusions of defibrinated human blood were reported, of which thirteen were said to have been successful<sup>24</sup>. The books and articles on the subject appearing in this period are very numerous. Geselius<sup>25</sup> and Hasse<sup>26</sup> reintroduced transfusion from animals to human beings. Lambs blood was generally advised, because its red blood cells were smaller than those of man. The febrile reaction, hæmoglobinuria, and other symptoms, which regularly appeared in these cases, were regarded as merely incidental. All these attempts at transfusion of heterogeneous blood were given up, after Landois' discovery<sup>27</sup> that the red blood cells are absolutely destroyed and dissolved, when injected into a different species of animal. Ponfick,<sup>28</sup> some years later, 1883, in his studies of hæmoglobinæmia, gave the explanation of the previously noted symptoms which appeared in heterogeneous transfusions.

<sup>22</sup> Berl. Klin. Wochenschr., 1871, No. 47

<sup>23</sup> "Works and Days," 1870

<sup>24</sup> Kohler, *Loc. cit.*

<sup>25</sup> "Zur Thierblut Transfusion beim Menschen," 1874

<sup>26</sup> Arch. f. Path. Anat., vol. 64, 1875, p. 52

<sup>27</sup> "Die Transfusion," Leipzig, 1875

<sup>28</sup> Virchow Archiv., vol. 62

Panum<sup>29</sup> Landois<sup>30</sup> and many others proved however that blood may functionate normally if transfused into an animal of the same species. In one of Panum's experiments by repeated bleedings of one dog with transfusions of defibrinated blood of other dogs he exchanged practically all (over 99 per cent) of the first dog's blood for that of the other dogs and yet the animal remained perfectly healthy.

That defibrination itself carried dangers now came to be recognized. Magendie<sup>30</sup> had already noted dyspnoea diarrhoea and bloody exudates in the serous cavities after transfusion of defibrinated blood and had warned against defibrination. A Kohler<sup>31</sup> in 1877 made the important discovery that intravenous injections of defibrinated blood or of serum even in animals of identical species might cause intravascular clotting (multiple thrombosis) because of the introduction of an excess of fibrin ferment. And Cohnheim<sup>3</sup> made the authoritative statement that injection of any blood in which coagulation had already taken place was an unpardonable error.

These things together with the general introduction of intravenous infusion of saline solution about 1875 caused transfusion to be gradually abandoned. And von Bergmann<sup>32</sup> in 1883 gave transfusion what appeared to be its death sentence. He reviewed the whole subject and came to the conclusion that the only reason there had not been more fatalities was that in most cases not enough fibrin ferment had been introduced to produce extensive intravascular clots. He said that the only allowable transfusion was direct from artery to vein but that the method was uncertain and cumbersome and coagulation was likely to occur in the cannula.

From that time up to the present century transfusion is scarcely heard of and writers who refer to it even as late as

<sup>29</sup> Loc. cit.

<sup>30</sup> *Leçons sur le Sang* Paris 1838

*Ueber Thrombose und Transfusion* Dorpat 1877

<sup>31</sup> *Vorlesungen über allgemeine Pathol* vol 1 1877 p 346

<sup>32</sup> *Die Schicksale der Transfusion im letzten Decennium* Berlin

1904<sup>34</sup> and 1906,<sup>35</sup> all mention it merely as a matter of historic interest, leading up to the introduction of intravenous infusion<sup>36</sup>

In the beginning of our century, transfusion may be said to have almost been rediscovered. Von Bergmann had laid down the conditions under which transfusion would be permissible, and, until recently, these conditions were not to be attained.

But, with the recent development of practical means of blood vessel anastomosis, direct arterio-venous transfusion again seemed to come within the realm of possibility. In 1898, Crile,<sup>37</sup> in Cleveland, began a series of experiments which he has continued up to the present, and with the most brilliant results.

At first he used suture methods to perform the anastomosis, but more recently, he has adopted the ring method, and has improved it by adding a handle to the ring. He has, experimentally and to some extent clinically, proved that transfusion is the best treatment for every degree of hemorrhage, as well as for surgical shock, and that (with certain possible exceptions to be mentioned later), the transfused blood suffers no impairment, and is a perfect substitute for the lost blood.

Crile has, up to date, reported seventeen clinical cases, of which the results are summarized as follows:

Positive Acute hemorrhage, pathological hemorrhage (from prolonged jaundice), shock

Negative Pernicious anæmia, leukæmia, carcinoma, strychnine poisoning, diphtheria

Doubtful Chronic suppuration, tuberculosis, typhoid

In all his cases, the immediate result was marked improve-

<sup>34</sup> De Bruere, Wiener Klinik, xxx, 1904, p. 223

<sup>35</sup> Kohler, "Gedenkschrift, etc." already cited

<sup>36</sup> Kuttner, Beiträge z. klin. Chirurgie, 1903, p. 609

<sup>37</sup> Journ. Am. Med. Assoc., 1906, xlvii, p. 1482

Proceed. Soc. Exper. Biol. and Med., 1907, p. 6 and p. 64

N. Y. Med. Journ., 1907, lxxxvi, p. 145

Cleveland Med. Journ., 1907, vi, p. 112

Canada Lancet, 1907, xl, p. 1057

ANNALS OF SURGERY, 1907, xlvi, p. 329

ment in the patient's condition with no injury to the donor. It also seems, from his experimental work, that transfusion will be curative in illuminating gas poisoning.

Recently Watts<sup>38</sup> has described four cases of transfusion by the use of Carrel's suture. In one of these probably very little blood was transfused as an occlusive thrombus was found. In the other three cases the amount of improvement was disappointing but the cases were very unfavorable.

One point whose importance has only lately become evident remains to be discussed.

That the blood of one healthy animal is physiologically interchangeable with that of another healthy animal of the same species is amply demonstrated. Whether the same is true if one of the animals be diseased is still an unsettled question. A recent report of a case of fatal hemolysis after transfusion,<sup>9</sup> Crile's and Watt's reports of destruction of red blood cells after transfusion in cases of pernicious anemia and the experimental results of Ascoli<sup>40</sup> indicate that in some diseased conditions mixture of blood produces hemolysis.

It is possible by methods now known to determine beforehand whether hemolysis is likely to occur when any two given bloods are mixed. Such an examination was made before the second transfusion described in this paper. A thing much to be desired is that a convenient clinical test for this purpose be devised. A test of this kind and a better knowledge of the diseases which contraindicate transfusion should make transfusion one of the safest and most valuable of therapeutic measures.

The author desires to express his thanks to the Department of Physiology of Columbia University for courtesies extended to several of the Attendings and to the House Staff of the German Hospital for advice and assistance and to Dr G. L. Rohdenburg for the photographs presented.

<sup>38</sup> Johns Hopkins Bulletin May 1907

<sup>39</sup> Pepper and Nisbet, Journ. Am. Med. Assoc. Aug. 3 1907

Isoagglutinine and Isolysine menschlichen Blutes

Deutsche Med. Wochenschrift 1901 p. 1239

# ON THE THYMUS GLAND TREATMENT OF CANCER ~

SECOND PAPER.

BY FREDERICK GWYER, M D ,  
OF NEW YORK,  
Surgeon to Bellevue Hospital

ON Wednesday, May 8, 1907, I presented to this society a case of recurrent cancer of the breast which I had been treating with dried thymus gland of the calf <sup>1</sup> I also at that time mentioned other cases which had been under the same treatment, and gave the methods of preparation of the glands and the modes of administration

It is my purpose in this paper to give my experiences with the thymus treatment since that time, feeling that my further investigations have, in part, borne out my first impressions concerning it

If I report so many deaths of patients while under treatment, I would ask you to consider the class of cases with which I have had to deal, also to bear in mind, in estimating the value of the thymus treatment, the utter hopelessness of every case

With one exception, every case of cancer which I have treated has been considered inoperable, incurable, and hopeless The exception was a fairly early case of cancer of the breast, sent in to Bellevue for operation, to which I gave thymus for about a week, in doses running as high as one ounce of powdered thymus There was no result and the patient was operated upon Most of the cases have had one or more operations, some have been too far advanced for any operation when first seen by the surgeon, and some

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\* Read before the New York Surgical Society, Wednesday, January 8, 1908

<sup>1</sup> Reported in the ANNALS OF SURGERY, July, 1907

have after operation had other treatments such as the X rays trypsin etc before receiving thymus treatment

It is natural that I should first take up the history of the case which I presented to you last spring and bring it to a conclusion

CASE I—Mrs B *Recurrent cancer of the breast with secondary involvement of the supra and infraclavicular glands* (The previous history of this case may be found in the ANNALS OF SURGERY July 1907) Patient of Dr A E Isaacs At the time of presentation the patient showed very marked improvement in that the glands had almost disappeared pain was less or absent and the cachexia was markedly diminished She had had a period of what I thought to be autointoxication from the breaking down of the cancer masses and absorption of the products and owing to her temperature and desperate illness the thymus was discontinued for two or three weeks (April 25 to date of presentation May 8) During that period of no treatment the glands had continued decreasing Two days after exhibition May 10 the supraclavicular glands showed a marked increase in size and while she had not entirely recovered from the illness above mentioned I did not dare wait longer so she was again put on thymus The enlargement continued until the 17th and was accompanied by general pains of a rheumatic character and by sweating especially at night but no fever One locality of the pain was the spleen which was found by Dr Block who was in attendance to be slightly enlarged

The glands subsided by the 23rd to where they were on the 8th and from that time to the end did not again become larger on the contrary they would sometimes become so small as to be barely palpable

Medication was continued until about July 15 with no particular change The general pains and sweating continued and she did not seem to gain strength following the acute attack Thymus treatment was discontinued until she should grow stronger and she went to the country for ten days gaining generally a good deal and feeling much better on her return The glands were still very small The heat and humidity in the city were at that time intense and she began to fail rapidly From July 15 to about October 15 when she died she received no

thymus During this period of three months she gradually grew weaker, lost a little flesh, had no appetite, there was no great rise in temperature, the pulse was a little rapid, and she had vague pains located at various but changeable places Dr Isaacs, Dr Block and I saw her at times, but could reach no conclusion as to the cause of her condition It is worthy of remark that during this time her skin remained clear and the mucous membranes quite red A few days before she died Dr Isaacs and I examined her and found the glands barely palpable, with no clinical evidences either externally or internally of other metastases As no autopsy was permitted, we cannot be positive in the conclusion we reached that the cancer process had been stopped and that her death was due to some other cause There was an hysterical element to be reckoned with She had had no thymus for three months before her death, which, in the light of other cases, eliminates that as a cause of death Cancer cachexia was very slight

In concluding her history I would ask you to compare her cancer condition preceding treatment with that at the time at her death

CASE II—Mrs F *Cancer of the pelvis* Patient of Dr A Brothers The patient had had a very complete removal of the pelvic organs several months before, notwithstanding which there was a recurrence within a few months, and in March her abdomen was reopened by Dr Brothers, under whose care she came at that time, but there was nothing to be done and the incision was closed, healing kindly When first seen by me, May 14, 1907, the right leg was  $2\frac{3}{4}$  to 3 inches larger than the left, and rectal examination showed a hard, nodular, immovable mass extending nearly across the pelvis, fully so in the left side The patient had great pain in the leg, groin and pelvis, and had been under morphine in increasing doses for several months X-rays had been administered from April 22 to May 9 with no effect She was distinctly hysterical

Thymus was given and continued to June 17 (34 days), the patient dying on June 30 At each weekly visit the mass showed reduction in size and greater mobility until at the last examination, June 11, the reduction amounted to at least 75 per cent, and the growth was freely movable

Owing to the reduction in the growth and the decrease in

swelling of the leg the pains which she still complained of were attributed to the desire for morphine which was very pronounced and uncontrollable

She contracted pneumonia June 17 and died three days later

CASE III—Miss D aged forty three Referred by Dr J M Hitzrot *Carcinoma of the right breast* The patient had undergone two operations and had been treated with X rays Pecurrence in the breast and in the supraclavicular and neck glands also in the same glands in the left side of the neck and in the axillary region Her right arm was greatly swollen from the shoulder to the fingers and showed venous congestion

Treatment with thymus was begun May 4 from which time until May 31 there was improvement as evidenced by reduction of the glands and of the swelling of the arm and by the better circulation both in the arm and generally Her skin lost its leaden pallor and became healthier looking while the mucous membranes were quite red

From June 1 to October 1 the glands showed but slight change being sometimes a little smaller and again a little larger but never so large as when first seen But small impression was made on the swelling of the arm which may be accounted for by operative interference with the axillary lymphatics and by the contraction of the cicatrix I have not seen her since October 1 but she reports that she is growing weaker although there is no increase in the growth Medication by thymus is still continued not with any hope of good results but at her desire as she says she feels better while taking it

CASE IV—Miss P Case of Dr J D Bryant *Carcinoma of the left breast* of very slow growth Six operations had been performed the first three years ago Slow return after each operation The last operation took place in March 1906 Has taken morphine judiciously Commenced thymus about June 15 continued it until about September 1 a period of nine weeks

The patient is a most intelligent woman of charming personality bearing her trouble with great fortitude and patience and well able to discuss her case and the results of treatment On October 30 she gave me her general impressions as follows At first the pain was relieved in part appetite improved strength



greater, color better Toward the last of the medication period pain was greater, appetite not so good, and the thymus was taken with difficulty During the entire time to October 30 there had been little or no increase in growths and certainly not so much as would have taken place without the thymus treatment The morphine had been increased, with the consequent nausea and lack of desire for food, the thymus powder was disagreeable to her, and as it showed no marked results it was discontinued

The patient was seen last on December 4 Her general condition was about the same, with locally a slight increase in one of the growths Greater pain demanded more morphine Her color was remarkably good

CASE V—T W Patient of Dr L S Pilcher *Carcinoma of cæcum and pelvis* Operation by another surgeon Came under Dr Pilcher's care on May 30 Then had a hard mass in the right lower abdomen the size of an orange, and a sinus surrounded by a cauliflower-like growth Never complained of pain Thymus medication from June 2 to 28 On the latter date Dr Pilcher reported to me that the "Patient was discharged at his own request, no appreciable effect having been observed attributable to the treatment"

CASE VI—M B Patient of Dr L S Pilcher *Carcinoma of the lower jaw and parotid gland*, starting as an epithelioma of the lower lip six years ago Two operations When admitted to the hospital and Dr Pilcher's care, the patient had a large, general, symmetrical swelling covering the ear and lower jaw region There was a nodular ulcerating surface within the ear The eye showed neuro-keratitis and ectropion of the lower lid Pain was slight Thymus given from June 3 to 28 Dr Pilcher reported on the latter date, "No good results noticed from treatment, no bad results noticed from thymus ingestion Growth steadily increased, as also the pain"

CASE VII—Dr McM Referred by Dr C H Mayo *Cancer of the pancreas* On July 9 Dr Mayo operated, finding a condition precluding removal, and the wound was closed July 24 patient came to me, when thymus was started and continued to August 17 At first there was an improvement in his general condition, color better, appetite better, and pain much less After two or three weeks the pain returned as bad as ever, appetite dropped to nothing and he lost weight and strength

rapidly About August 10 a tumor was palpable in the pancreas region which was not to be felt previously Patient was advised to return home Later accounts show a progression of the disease and he died on December 6 1907

CASE VIII—B W aged fifty-one Referred by Dr Walton Martin *Carcinoma of cheek* First symptom noticed March 15 1907 Two operations April 7 and May 18 Referred to me May 27 Examination showed a hard ulcerating mass in right cheek The neck glands had been removed and there was no recurrence in that region Medication by thymus was started

May 31 There was a reduction in the size of the cheek the mass was softer and patient could open his mouth wider

June 3—The entire right side of the face was much swollen reddened hot and tender He had a high temperature—in fact all the symptoms of an acute infection

June 8—Office treatment being ineffectual with Dr Martin's consent the patient was sent to Bellevue Hospital

July 15—The inflammatory condition lasted some time and under this date Dr Hartwell reported that the patient was failing rapidly He died August 16 1907 The thymus was continued to July 1

CASE IX—C J R Referred by Dr R J Scofield *Carcinoma of the floor of the mouth* First seen on May 9 1907 The growth began six months previously There had been no operation Examination showed a mass filling the entire right side of the floor of the mouth bringing it even with the lower teeth and extending somewhat to the left side The submaxillary sublingual and upper cervical glands were enlarged The patient was unable to masticate Medication by thymus started on the same date

May 15—Eats solid food feels better pain is less growths smaller Improvement continued until May 27 when after an evening of alcoholic excess on the 25th the growths were found larger and patient was unable to take solid food

June 7—The growths were again decreasing in size

June 10—The growths were larger and the left submaxillary showed an acute inflammatory condition

October 3—From preceding date to this there was continuous and rapid growth of the cancer Treatment was stopped about September 1 since which time the progress has been more

rapid The patient was alcoholic, and, notwithstanding instructions to the contrary, continued his drinking during treatment

CASE X—J C, aged 55 *Cancer of rectum* Case of Dr J Prescott Grant First symptoms two and a half years before Examined by a physician one year ago, sent to a hospital, but growth was considered too far advanced for operation Six months ago had a left inguinal colostomy performed Since then has been more comfortable, but has had constant pain and continued loss of weight and strength He was passing blood and mucus every hour or so, and had been taking morphine daily for months

Examination when first seen by Dr Grant, May 28, 1907, showed a hard ring half an inch above the internal sphincter, completely encircling the bowel Its surface was covered with hard nodules varying in size from that of a hazelnut to that of a walnut These nodules extended as far as the finger could reach The whole growth was exceedingly hard and firmly adherent to the adjacent tissues The examination was painful and was followed by a discharge of blood The patient was emaciated and a moderate degree of cachexia was present There was no enlargement of the spleen or liver, and no glands were palpable

Thymus was begun May 28, 1907 On the fourth day pain was less severe At the end of the first week the pain was much less and he had taken no morphine for two days Discharges were less frequent There was no change in the local condition

June 11—There was somewhat more pain and morphine was recommenced The discharge was increased His general condition was improved, the patient having a feeling of well being The nodules were not so hard

June 28—General condition improved, discharges less frequent, nodules softer, smaller, and individual nodules movable on base The patient's condition, both general and local, now remained unchanged for six weeks

Two weeks later, August 24, making twelve weeks from the first examination, the growth was found diminished in size, the whole mass somewhat movable, and the nodules soft There was very little pain and no blood on examination

Patient passes no blood and the ulcerations are apparently healed There are no metastases palpable General condition improved

At the last examination two or three weeks ago the whole growth was found elastic and distinctly movable. There were no hemorrhages no metastases and the general condition was better than it was five months ago. The patient now takes morphine occasionally sometimes going two or three days without a dose. Treatment is being continued.

Dr Grant tells me that there was absolutely no hope from operation when treatment was begun but he now feels that if the patient continues to improve generally an operation would be feasible and advisable.

CASE VI—Mrs L. aged sixty nine *Carcinoma of breast*  
Case of Dr A E Isaacs

June 12 1907—Recently noticed a mass in the left breast the size of a hazelnut not painful. The lymphatic glands of both supraclavicular regions were enlarged those in the left side being the larger. The largest glands were the size of a small hazelnut. Weight 149 pounds. No cachexia. Vague history of rheumatism.

June 24—Treatment with thymus begun.

July 1—Breast mass larger supraclavicular glands on left side about the same on the right side much smaller.

July 29—Until this date patient felt better and had better appetite. Breast mass showed continued decrease in size with disappearance of secondary infiltration. The supraclavicular glands on both sides grew gradually smaller and softer. Constipated.

August 5—Feels pain. Breast mass the same. Supraclavicular glands harder and the right larger.

November 11—Since August 5 the local conditions have alternated at one time the masses would be smaller at another larger generally speaking they were no larger than when treatment was begun five months ago. Her general condition was better and there had been no extension of the process to other glands.

December 9—Dr Isaacs writes me that during the last month the patient had failed in every way. The growths were all larger she was losing flesh and a marked difficulty in breathing made him think of possible mediastinal metastasis or pressure on the recurrent laryngeal due to increased size of the deeper neck glands.

He says that notwithstanding the present comparatively poor report, the condition of the original glands is such that were they as they now are when he first saw the patient, he would have offered operation. While, when first seen they were matted together forming masses, now each gland is separate and very freely movable.

CASE XII—O'C *Cancer of tongue* Patient of Dr John Rogers

First appearance of growth in August, 1906. Two operations, the second for involvement of the tonsil.

May 15, 1907, when thymus was begun, there was suppuration in the mouth and two or three sinuses in the cheek and beneath the jaw, externally, with a good deal of discharge. The neck glands were involved in the growth and in the ulcerations.

June 15—Thymus was continued to this date, the patient dying soon after, I believe of pneumonia.

Dr Rogers reports that pain was relieved in part, the suppuration lessened, and for a while the growth was held in check.

CASE XIII—H H, aged fifty-eight *Cancer of pleura*  
Case of Dr W L Niles. Cancer history in family. Mother died of cancer of the intestines. Wife had two operations for cancer of the breast, now apparently cured. Rheumatic history.

First symptoms July, 1905. First seen by Dr Niles October 21, 1907. Diagnosis of epithelioma or endothelioma of pleura was made on October 26, 1907, and confirmed by Dr W G Thompson.

Chest aspirated October 26, and twelve ounces of reddish-brown fluid withdrawn. October 31 thirteen ounces of fluid of the same character.

November 5—Thymus started. Up to this time the patient was getting worse very rapidly, had very severe pain, took only fluids, and at times was slightly delirious.

November 14—Improved to this date. Less pain, good appetite, mind clear.

November 15—Chest filled with fluid very rapidly and his condition again became extreme, and it did not seem possible that he could live twenty-four hours. Thymus stopped.

November 17—Thymus again started.

December 7—Since November 17 condition has gradually improved till this date, except emaciation and anæmia, which

have progressed. He has little pain, eats well, mind is active and clear and he sits up in a chair. His general condition was so good that he was permitted to return to his home in Philadelphia.

Dr. Niles sends me the following with his synopsis of the history: It is my opinion that since using the thymus the new growths have not increased in size and in the cervical region they appear to have diminished. He has had less pain, a better appetite and clearer mentality. Emaciation and anæmia have however progressed.

CASE XIV—J. S. *Carcinoma of the uterus*. Referred by Dr. R. J. Scofield. When first seen by me May 2 the growth seemed localized to the cervix, but at operation on May 4 the lymphatics were found so affected that although a complete removal of all the appendages was made a prognosis of further growth was given. Dr. Scofield and the family. The patient was to report to me at the first sign of recurrence.

October 11 she returned and examination showed a mass low down in the pelvis extending from the left anterior superior spine to two or three inches beyond the middle line. It was irregularly nodular, hard and immovable. There was evidence of ulceration in the vagina and a discharge at times bloody and swelling of the legs, the right showing the most. There was sharp cutting almost continuous pain and the patient had lost weight rapidly. On her first visit she was almost too weak to travel. Dr. Scofield told me the growth had appeared only recently and had advanced with great rapidity. Thymus was started.

December 12—Without giving details of her progress it may be stated that except for occasional setbacks for a few days she has improved both generally and locally. The growth is half the size it was, there is less discharge, much less pain, her weight is within two pounds of what it was on October 11, her appetite is good, her color is good and she is much stronger. Treatment has been interfered with at times by a temperature which would reach 102. She is now running an afternoon temperature of 99 to 100.

CASE XV—M. G. *Carcinoma of the intestines and peritoneum*. Admitted to Bellevue Hospital May 11, 1907. First symptoms six months previous to admission. Examination

showed a hard, irregular mass filling the lower abdomen. On rectal examination the mass was found to fill the entire inlet of the pelvis. There was no ascites and no pain.

May 15—Thymus medication started and continued until May 26. At first patient was more comfortable and felt generally better. Later his abdomen became distended with fluid, and on May 26 sixty-two and a half ounces of fluid were withdrawn. Palpation showed a decided reduction in the growth.

June 4—Soon after the tapping, the abdomen again filled, the patient became rapidly weaker and he died on this date.

Dr. Frink, the house surgeon, is quite positive that the mass had become very much smaller and much more movable.

CASE XVI—A. S., aged sixty-six. *Carcinoma of rectum*. First symptoms six months before.

May 3—Admitted to the surgical service. Examination showed a well-marked growth including the entire circumference of the rectum, firmly fixed, and the lumen so small that it would not admit the little finger. The surface was ulcerating. Examination was painful and followed by blood. The patient complained of great pain and said she habitually passed blood with the stools. She had been under observation in the medical wards for several days and had received frequent doses of morphine to relieve the pain. Thymus medication started.

June 25—Patient asked for her discharge. The thymus was continued to this date. Several examinations of the rectum were made and at each the mass appeared smaller, softer, less fixed, more movable, and not so painful. The lumen increased so, either from reduction or from ulceration, that the index finger was very freely admitted. Pain was so relieved that I find but nine doses of morphine were administered during this time. I am informed by Dr. Frink, the house surgeon, that most of the time she was up in a chair, and when she left the hospital her general and local conditions were much improved.

In addition to the cases reported, a number of cases were under treatment for a few days only. These I have omitted as they would be of no help in forming opinions. Other cases have been treated under conditions which prevent my presenting sufficient history. Others have been under treatment but a week or two. Of the latter I can say that all

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12	J S	D R J S f d	P i u	M y 5 7 d y	D h				
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Expt	by	Citation
1	W. H. Cline	1959
2	W. H. Cline	1960
3	W. H. Cline	1961
4	W. H. Cline	1962
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109	W. H. Cline	2067
110	W. H	



show the improvement at the beginning which the reported cases show

Besides cancer, I have treated a few cases of some other conditions in pursuance of the suggestion contained in my first paper that thymus might be applicable to diseases other than cancer. I will say no more at this time than that the cases so treated seem to bear out my previous statement.

The foregoing histories of cancer cases present several prominent points, *viz*

1 With the exception of two or three cases, all showed temporary improvement in that there was

- a* Less pain,
- b* Reduction in growth,
- c* General condition better

This improvement was quite prompt in making its appearance

2 Several of the patients died or at present writing are near their end

3 Many of those that died did not succumb as the cancer patient ordinarily does, in that

- a* There was no great loss of weight,
- b* No leaden pallor and other visible signs of cachexia,
- c* No local increase of the cancer

On the other hand, at least two of the fatal cases continued fairly well nourished, with clear skin, red mucous membranes, and an actual and marked reduction of the cancer growth, with no evidence of metastases. The same is true of some still living

4 The deaths were rather peculiar, and must be attributed to one of three causes:

- (1) Progression of the cancer,
- (2) Effects of the thymus treatment,
- (3) Effects of some substance set free by the thymus medication which was not eliminated

That the fatalities were not due to the first, I can only say that clinical evidences pointing to a progression of the

cancer process were not present and I am inclined to believe growth and extension had been stopped

That deaths were due to the thymus treatment directly I think can be negatively answered by the fact that

(1) Treatment in some cases had been discontinued for a long period previous to death in case I for three months

(2) That other cases still living have taken thymus for much longer periods in as heavy doses and some are if anything holding their own or improving (See cases III X XIV)

On the other hand it is possible that the continued use of the thymus has caused the formation of an antibody of such toxicity persistency and quantity as to cause the condition preceding death

That the deaths in some instances of those having had thymus treatment may be due to a liberation of some toxic material which is not eliminated I believe to be possible and fairly probable This material added to the constitutional condition which favored or gave rise to the growth of the cancer was more than the system could stand I have recognized this as a possible danger and even in my first paper mentioned the great importance of elimination

The cases may be divided for the purposes of study and for indications as to the method of administration of the thymus into two classes

(1) Cancer in or near the digestive organs

(2) Cancer not involving the digestive organs

Illustrative of the first group are the cases of cancer of the cheek (Case VIII) that of the floor of the mouth (Case IX) and that of the pancreas (Case VII) In none of these was the disease checked to any great extent and the results were the most discouraging of the lot I attribute the difference in action of the treatment in this class as compared with Class II to the action of the digestive juices on the thymus powder and the distinct interference with proper nourishment and assimilation

The cases of abdominal cancer in a man (Case XV)

and one of the two recurrent cancers in the pelvis (Case II), showed a very rapid reduction with no extension of the growth and rather rapid termination as compared with, for instance, the two cancers of the rectum (Cases X and XVI), which were slower in reduction and one of which, after several months' treatment, is still gaining

The cases of recurrence of cancer of the breast were still slower in showing effects of treatment and the effects have been more permanent

All of the cases of the second class showed uniformly a reduction in the growths which did not again enlarge to the size before treatment, and in none of these was there any clinical evidence that metastatic growths had formed since treatment was begun

The thymus medication has consisted mainly in the administration of the dried gland in powder form. One of the cases received the watery extract of the gland containing nucleo-proteids and other products (prepared practically as reported in my previous paper), given by mouth for a while. Several received the same watery extract hypodermically. The usual dose was one to two drams by weight of the powder three times a day, or the equivalent of one dose hypodermically once a day. I found no advantage in larger doses and but slight results from smaller ones.

The plan I have recently followed, and the one I think best at this writing, is to give the extract hypodermically to cases of cancer in or near the digestive organs, and to give the powder to all others. No difference was noticed in the action, whether given in powder or extract. The hypodermic administration is somewhat painful but never has caused more than a passing redness where injected. I repeat, its use should be limited to cases of cancer in or near digestive organs.

I realize that the thymus treatment has not yet in itself proved curative, and in the search for the necessary adjunct I will mention that I have tried change of climate, getting a temporary improvement in dryer, cooler air than New York

furnished last summer modifications and limitations in diet having tried an all milk diet a no milk diet and at present am trying a diet free from starches and sugars Neither the all milk diet nor the no milk diet seemed to give any particular result The diet free from starches and sugars is not yet tried out.

I have also tried several drugs in conjunction with the thymus notably potassium iodide carbonate of soda bicarbonate of soda etc I am now using the acetate of soda in doses averaging gr 30 t i d with an idea of eliminating by the kidneys as well as increasing alkalinity I think there is an undoubted lessened alkalinity of the blood in cancer and it has been my endeavor to increase the alkalinity and oxygen carrying power of the blood and to promote elimination I would reiterate the necessity for elimination in every possible way—by the skin the bowels and the kidneys

Whether it be a drug such as one of the above whether it be some organic substance other than thymus or whether it be some special part of the thymus which is wanting to form the second step in the successful treatment of cancer I cannot but feel that thymus will be found to be part of the finally accepted treatment

One can well imagine that with so complex a disease as cancer it may be a combination of remedies rather than one which eventually gives us control of the disease On the other hand it may be one or more of the several constituents of the thymus which are necessary the others acting either as retarders or actually as antagonists I have spent a great deal of time trying to separate the different constituents but owing probably to lack of technical training in physiological chemistry I have failed as yet to produce anything more effectual than the watery extract

I have been asked why I have not treated cases that were more favorable I have felt that the best work could be done with advanced cases and my supply of thymus was so limited that I could not well take more cases I think all cases admitting of operation should have one and that

at present there is no remedy which offers so much chance for cure as the knife. The value of thymus will be found in the treatment of cases after an unsatisfactory operation; I mean those cases in which at the time of operation we feel we have not eradicated the entire disease. Inoperable and advanced cases will, I think, be benefitted, their lives prolonged and made endurable, and some such may be so benefitted and the local condition so improved that an operation may be rendered feasible.

The last observation I wish to record has to do with the lasting effects of the treatment. It would seem from my records that either the action of the thymus continues for a fairly long time, or it so alters constitutional conditions that the tendency to growth is stopped. The advantage of this observation will be found in treating post-operative cases which present nothing by which we may judge our progress. That is, it would point to periods of treatment with shorter or longer intervals between.

I would take this opportunity of thanking those sending me cases and those giving the treatment a trial and furnishing me reports of their cases. I would also thank Dr S P Beebe for help from his writings and conversations, Mr Fetterly of Swift & Co, for facilitating my getting the thymus glands in proper condition, and Mr H A Gardner, of Providence, R I, for laboratory help.

# THE PARATHYROID GLANDS

BY NORMAN PHILIP GEIS M D

OF BROOKLYN NEW YORK

Dem    trat    f A   t my i   th   Lo g i l a d C l l g e H   p t l  
A    ta t S   g on W ilham b   g H   p t l

**HISTOLOGY**—In 1880 Sandstrom discovered a pair of small glandular masses lying in close relation to the posterior part of each lateral lobe of the thyroid gland. These he named the parathyroid glands.

These parathyroid glands are small reddish brown or yellowish brown ductless organs. Most of the glands are of the reddish brown color due to the rich blood supply. When the gland assumes the yellowish tint it is because of the amount of fat that it contains. Of thirty seven glands observed only one was of the yellowish hue. They are flattened antero-posteriorly and the long diameter is generally in the superior-inferior direction. They are somewhat bean shaped or better still kidney shaped with a sort of a hilum where the artery enters. In size they vary greatly. The average long diameter is one quarter of an inch while in width we have an average of one eighth of an inch and the thickness of one-eighth of an inch. They range in size in the long diameter from one sixteenth to seven sixteenths of an inch.

Each gland is composed of solid irregular masses of epithelium like cells arranged in columns. These columns of cells anastomose with one another. Numerous blood vessels are seen between the individual columns but there are none between the individual cells. The parathyroid is absolutely different from the thyroid and is not like an accessory thyroid. The latter are always of thyroid tissue. Lymph follicles have been found in the parathyroid glands. Each parathyroid has a separate and distinct capsule similar to that of the thyroid but very much thinner. Wherever this gland may be found it is always within its own capsule. The capsule itself may be

intimately connected with the thyroid capsule, but the substance of the gland never has any outside connections. This capsule sends off septa that separate and support the cell columns. There are no septa between the individual cells.

Gley thought that the parathyroids represented embryonic portions of the thyroid. Later and after more extended study he proved that they were of their own kind, that is, not like any other gland. Pienant finds them similar in appearance and structure to the carotid bodies. Welsh considers that they resemble the anterior lobe of the pituitary body more than they do the suprarenal glands, as claimed by Richardson, and that they are unlike thyroid tissue. MacCallum and all recent writers are agreed that these organs are separate and distinct glands and have a different function than the thyroid gland.

*Number*—Four is the usual number of parathyroids in the human body. There may be as many as five or only one can be found. Because of their small size and the variety of location one may overlook them. Another factor that makes them difficult to find is the yellowish color, which so resembles fat that they are passed over as fat globules. Again the brownish ones so resemble muscle that when dissecting the thyroid free from its surrounding structures a small piece of muscle may be taken for the gland. A lobule of fat that is bruised, that is, slight bleeding has taken place in it, is very similar to the parathyroid. The difference can be told by touch for the gland gives a peculiar hard feel that the fat lobule does not give even when filled with blood.

Although the number four gives an anatomical symmetrical classification this arrangement is found wanting in over 25 per cent of the cases. Berkeley found but 2.5 glands to the person in 125 autopsies. Pool 2.9 in sixteen thyroids examined. In twelve subjects that I examined I found thirty-seven parathyroids or  $3\frac{1}{12}$  glands to the person. It is claimed that the superior are more constant in number but my findings have been superior seventeen and inferior twenty. Of course, a greater number may change this proportion. It is also claimed that if there is only one parathyroid found it is the

superior I cannot prove this from my dissections for I never found less than two to a person I have been unable to find more than four to a subject although the fifth one has been found a number of times This fifth gland is usually some distance from the thyroid itself

*Location* —The parathyroid glands are generally located on the posterior surface of the capsule of the thyroid gland They are outside of the capsule and closely adherent to its surface Thirty four of the thirty seven parathyroids found were on or adherent to the posterior surface of the capsule of the thyroid Inside the capsule of the thyroid I found one and some have been found on the anterior surface of its isthmus

The superiors are generally located on a level with the cricoid cartilage Or on the level of that space between the cricoid and the upper margin of the isthmus of the thyroid The superiors may be found anywhere from the level of the lower border of the isthmus to the summit of the lobe Occasionally a parathyroid is found above the thyroid The thyroid gland wrapping itself about the trachea has its lateral lobes in relation to the trachea and the œsophagus Now in one third of the cases the parathyroid will be found in relation to the above mentioned structures at their junction The superior may be found below the isthmus of the thyroid This is rare I found it once These two superiors are called internal because they are generally located on the posterior internal surface of the thyroid They are more constant in position for when they are present they will be found in that limited area of the upper two-thirds of the posterior surface of the thyroid gland

The two inferior or external bodies are more varied in their location They are called external for the reason of their being further away from the median line than the superiors Also from their location on the postero-external surface of the lateral lobe The usual location is at or within one half inch of the lowest part of the lobe of the thyroid gland It may be found either anterior or posterior to the recurrent



laryngeal nerve When one is found posterior to the nerve it is usually the left Its relation to the inferior thyroid artery is inferior to the branches that pass to the posterior surface of the thyroid In only one instance did I find a parathyroid gland above the inferior artery It is always close to the artery The parathyroid may be just below the thyroid or some distance from it Even on or in the substance of the thymus gland they have been found It is not rare to find one just within the thorax The lower parathyroids are more difficult to find for the following reasons First, they are not in so close a relation to the posterior capsule of the thyroid, second, often in the loose fat just below the gland, third, because there is more fat here than around the location of the superiors, fourth, the inferior are somewhat smaller than the superior Evans found that six out of nineteen inferior parathyroids were below the gland, but considers it unique to have this great proportion I found but two out of twenty below the gland

When the four are found it is always a superior and an inferior to each lateral lobe of the thyroid With three the arrangement may be two superior and one inferior or vice versa Given but two glands the usual positions are an inferior and a superior Four had this placing while one had two inferior parathyroids, one being on each lateral lobe They may be on the same lobe or one on each lobe I found them three times on the same lobe while in two other specimens the arrangement was one on each lobe This was the placing in the five times that I found but two parathyroids to the person I can find no statistics bearing on this point

*The Blood-Supply*—The parathyroid glands are always supplied by a special parathyroid artery This artery supplies the gland itself and nothing else It is always a direct and separate branch of the thyroid arteries or one of their main divisions At times two or more arteries are seen running to the gland but only one enters the gland The others supply the fat around the gland This parathyroid artery enters a hilus in the gland When the parathyroid is adherent to or within the capsule of the thyroid, the capsules have an arterial

anastomosis This anastomosis ends with the capsules there never being any communication with the gland itself

In about 50 per cent of the cases there is a large anastomosis on the posterior surface of the capsule of the thyroid formed by the two arteries on the same side This has been termed the channel This arterial anastomotic channel is formed by the superior and inferior thyroid arteries of that side of the neck only It runs along the posterior surface of a lateral lobe and generally near the mesial border Its formation is usually as follows The superior thyroid artery divides into two main divisions when it reaches the thyroid gland One we will call internal & nearer the medial lobe the other external The inferior thyroid artery on reaching the gland divides into two or three main branches We will call these internal middle and external as per the arrangement given for the superior Either the internal or the external of the superior anastomoses with internal or middle of the inferior artery to form the channel It is very uncommon to find the external division of the inferior forming the channel The usual arrangement is for the two internals to form this channel which I found in thirteen of the twenty four specimens examined

The inferior parathyroid artery is always a branch of the inferior thyroid artery or of the channel of anastomosis The superior parathyroid artery may be a branch of the superior thyroid artery Pool states that it is always supplied by the superior thyroid artery This statement does not follow my observations The supply was always from a direct branch of the inferior thyroid artery or from the channel Even when from the channel the angle of direction of the artery is such as to lead one to the conclusion that the blood comes from the inferior artery In the seventeen superior parathyroid glands found none got their artery from the superior thyroid Therefore it would seem from this that it is extremely rare for these upper glands to be supplied from the superior thyroid artery When the parathyroid artery does not come from the channel it most often comes from either one of the two internal branches of the inferior artery

In three specimens the parathyroid artery was found a direct branch of the inferior thyroid artery. As seen in Fig 1 the parathyroid artery arose from near the thyroid axis. This was three inches long. It is very frequent that the superior and inferior glands are supplied by the same division of the inferior thyroid artery. It is of great importance to note, that at times the two internal divisions of the inferior thyroid artery anastomose across the isthmus of the thyroid gland. This is of prime surgical importance as will be shown below. Twice the cesophageal artery of the inferior thyroid gave off the inferior parathyroid artery. This is another important point in the operations and their results. The parathyroid artery may also be a branch of one of the main muscular thyroid arteries.

*Results of Injury to the Parathyroid Glands*—Although we have no exact knowledge of the functions of these glands we must now recognize them, preserve them and keep their blood-supply inviolate. That there is a function we have no further reason to doubt.

It has been shown by Gley, Vassalé and Generali that when the parathyroid glands are removed in dogs death results in about three days of a generalized tetany. Destruction of the thyroid alone produces disturbances of metabolism, which appear slowly, and gradually lead to myxedema. Destruction of the parathyroids alone produces acute, rapid, fatal nervous phenomena, that is, tetany. This tetany is of central nervous origin. The tetany can be relieved for a short time by bleeding and transfusion of saline into the veins. This would lead one to believe that there was a toxin in the blood. Feeding of the parathyroid gland does not stop death. All recent writers agree that tetany and death must result from the removal of all the parathyroids. The destruction of their blood-supply causes the same fatal result.

In the great majority of cases the tetany following operation for the removal of all or part of the thyroid gland, is not due to the removal of the parathyroids themselves. It is due to the destruction of their blood-supply. This is a well proved

fact In the numerous thyroids examined after operative removal few parathyroids have been found Therefore the tetany following must have been caused by the cutting off of the blood supply of the remaining gland or glands Halsted states that tetany results even from the ligation of but one thyroid artery This fact is proved in one of my specimens as per Fig 5 if the inferior thyroid were tied the only two glands would loose their blood supply and therefore be destroyed This would also result in the case as shown in Fig 7 Kocher directs that two arteries should never be tied at one sitting and that never more than one half of the thyroid gland should be removed except for some special reason The same specimens give great weight to his dictum

*The Surgical Saving of the Parathyroid Glands*—I believe that with a proper operation and careful dissection the whole thyroid gland can be removed without causing tetany The essential thing in the operation is to recognize the parathyroid glands and their blood vessels Neither of these must be injured

The operation is as follows Make the collar incision and reflect upward the skin for one half inch and then make a similar incision in the platysma muscle superior to that of the skin All vessels that bleed ever so little must be at once clamped This rule must be followed throughout the operation as staining of the field with blood is fatal to a good dissection It also increases the difficulty in locating the parathyroids Reflect this skin muscle flap well above the summit of the thyroid Now make a mid line vertical incision through the fascia only deep enough to enable one to raise the sterno-hyoid and omo-hyoid muscles Raise these muscles and put two clamps on them as near the hyoid bone as possible cut between the clamps and do not remove same till ready to suture muscles (Mayo) Clamp and cut the sterno thyroid muscle separately thereby saving bleeding and giving more room by being able to retract the two former muscles more freely (Halsted) The sterno-thyroid muscle is a very vascular muscle and being well spread out over the thyroid gland is diffi

cult to separate and retract without free bleeding therefore Halsted's plan is excellent All severed muscles now being strongly retracted you raise the lobe from its bed Be careful not to tear the delicate blood-vessels entering it Now grasp the upper pole with the fingers and make traction forward and in towards the median line This brings the superior thyroid vessels that enter the gland into view. Working now from the external superior border of the gland and towards the median line clamp all vessels as they enter the gland Clamp these vessels as close to the gland as possible It is not necessary to clamp on the gland side as the traction put on the lobe stops oozing Cut between the clamp and the gland By this method of clamping and cutting the freeing of the upper pole is easy and there is slight danger of injury to the superior parathyroid With the upper pole free draw a little more downward and inward so to put the inferior thyroid artery branches on the stretch Clamp these as they enter the gland Be careful of too much pressure on the trachea Intermittent traction from now on is better This shortly brings into view the two or three main branches of the artery As this vessel is tortuous, the traction made straightens the artery and the lobe can be turned so as to expose its posterior surface The parathyroid should be found and its artery traced to its source Clamp the thyroid branch distal to this source The other one or two divisions may now be clamped with impunity This frees the whole lobe and the recurrent laryngeal nerve is seen and thus avoided Halsted after bringing into view the inferior thyroid vessels notes where they enter the gland He plunges a sharp pointed clamp into the substance of the gland at this point seizing the vessels Cutting distal to this frees the gland and saves the blood-supply of the parathyroids Either method is safe

There can be shown a number of important surgical points from the specimens that I have Fig 1, the older operation of complete removal of the thyroid could have been successfully done The left inferior parathyroid not injured on account of its artery arising from the main trunk of the

REAR VIEW

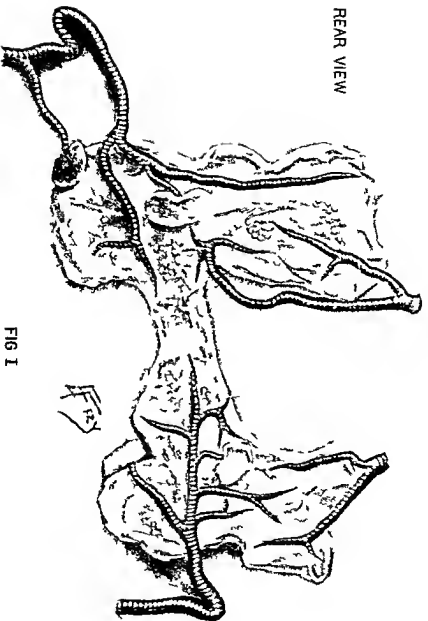


FIG 1

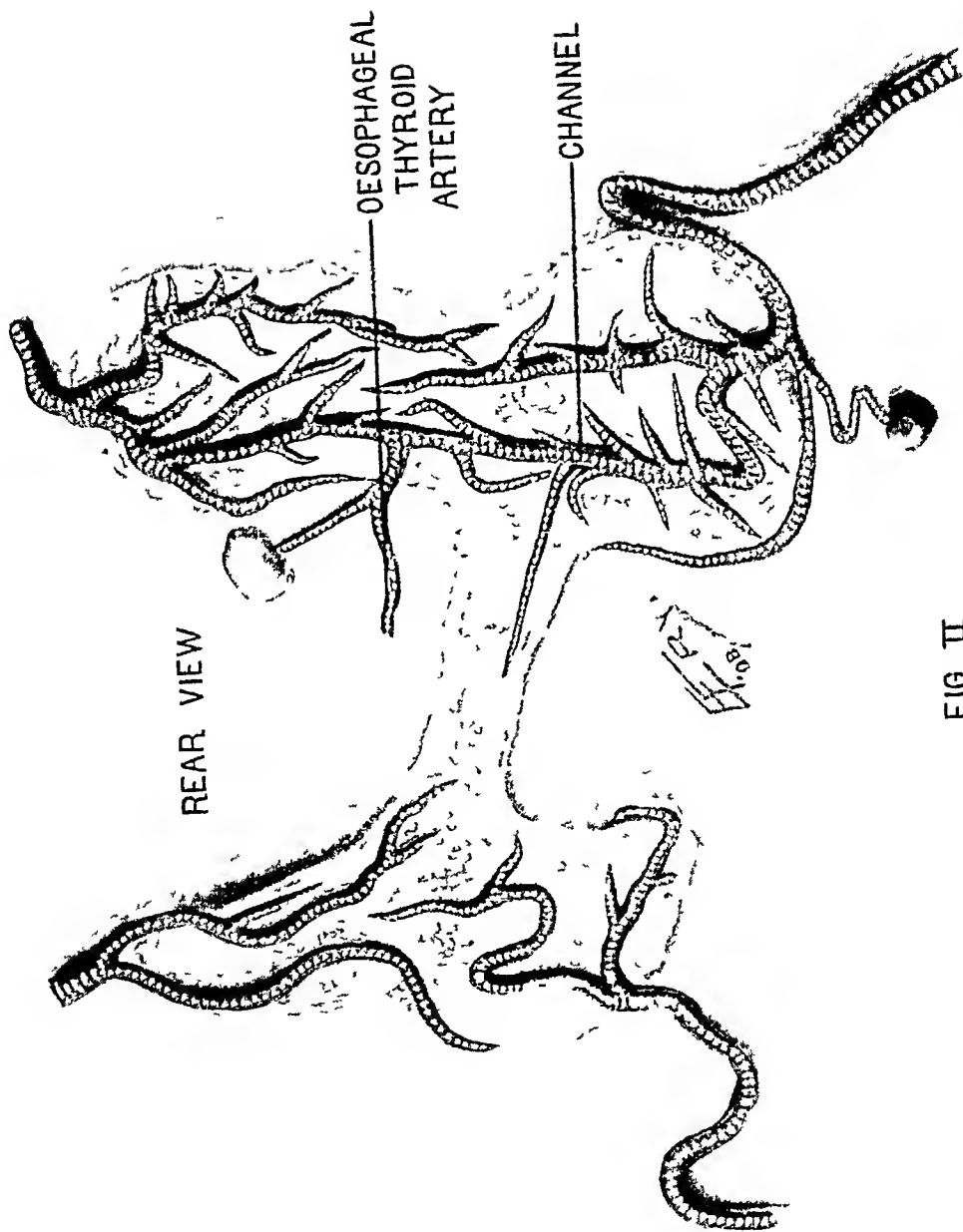
Tri p u s a e l d i a u i p p l y

REAR VIEW

OEESOPHAGEAL  
THYROID  
ARTERY

CHANNEL

FIG II



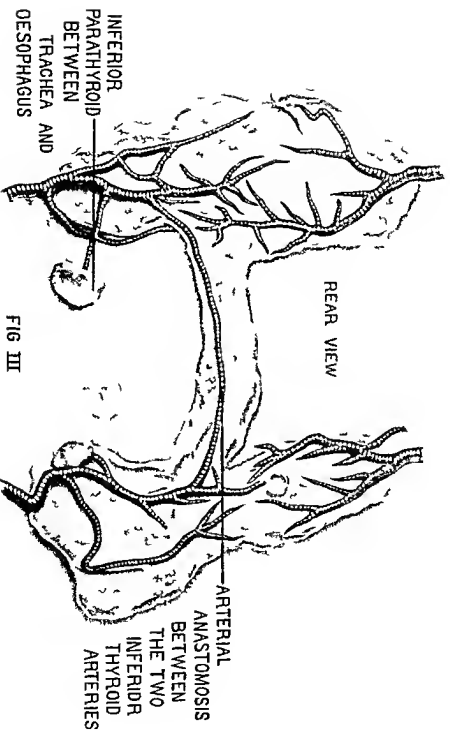


FIG III





thyroid artery Figs 2 and 4 offer another explanation why tetany did not result with removal of the whole thyroid In Fig 2 the superior gland was not connected with the capsule. It would therefore be left Its blood supply would be maintained by the œsophageal connection with the parathyroid artery Fig 4 shows the right inferior parathyroid artery a branch of the œsophageal thyroid artery and this gland was only touching the capsule of the thyroid As all œsophageal arteries anastomose with one another the supply of blood is assured In Figs 3 and 6 because of the two inferior thyroid arteries forming an anastomosis with one another across the isthmus of the thyroid one would be safe in removal of one half of the gland or the ligation of two arteries on one side In either case the saving of one gland and its blood is sure

#### SUMMARY

- 1 The parathyroid glands are essential organs
- 2 Each gland has a separate and distinct capsule
- 3 The average number to a person is about three
- 4 They are generally located on the posterior surface of the capsule of the thyroid
- 5 Each parathyroid gland has a special parathyroid artery that supplies it and it alone
- 6 Destruction of the parathyroids causes death from tetany
- 7 Cutting off of the blood supply causes the same fatal result.
- 8 The loss of their blood supply is the more frequent cause of death
- 9 To save them and maintain their blood supply only the arteries that enter the thyroid gland should be cut
- 10 The safest method of operating is from above downward

# ACUTE DILATATION OF THE STOMACH AND ARTERIO-MESENTERIC ILEUS

BY WALTER B. LAFFER, M.D.

OF CLEVELAND, OHIO

(Part II Continued from page 416)

## AN ANALYSIS OF THE 217 REPORTED CASES

Hoping to throw some light on this subject, or to at least obtain some useful data, I have critically analyzed all the literature and case histories. I have found 217 cases reported in the literature with 135 (63.5 per cent) deaths, 77 recoveries (36.4 per cent), and outcome not stated in five cases. Of the 135 fatal cases 120 were examined at autopsy.

*Age*—Contrary to the statement Rokitansky made that Acute Dilatation of the Mesenteric Ileus type is more frequent with the aged, we find Acute Dilatation considering all types, as most frequent between the ages of twenty and thirty. Next in frequency, between thirty and forty and then between ten and twenty. Only five occurred before ten years. The oldest was seventy-four.

Beck<sup>139</sup> has written of the cases occurring in children but there were two cases reported in infants worthy of special mention. One reported by Behlilos<sup>50</sup> where a child nine months old always previously healthy and exclusively breast fed. It had no vomiting and no stomach or bowel trouble. The child was found dead two hours after being nursed. Overlying was excluded. Autopsy—No rickets. Stomach as large as foot ball, no constriction of pylorus. Duodenum not dilated, stomach contained a small amount of milk but a great amount of gas.

The other case occurring in infancy was reported by

Cooper<sup>61</sup> A child eleven months old shortly after taking its bottle and while laughing and playing and in good health suddenly seemed to stop breathing It made a noise in the throat became insensible and died in a few minutes without a struggle or a convulsion No signs of rickets or syphilis

Autopsy showed that stomach was greatly dilated containing nineteen ounces of Mellin's Food besides a lot of gas while stomach at this age should hold only about nine ounces The heart was pale and flabby

Kundrat<sup>83</sup> states that many children suffer from acute dilatation of the stomach due to the filling of the organ with air which is swallowed or with gases of decomposition and that gluttony in children frequently induces pathologic distension of the stomach which may produce alarming symptoms

*Sex*—Cases were about equally divided between the two sexes Considering that visceral ptosis has been often blamed for the trouble and as ptosis is more frequent in women one would expect the condition to be more frequent with them

*Following an Operation*—Ninety seven (38.2 per cent) followed an operation Of the post operative cases as nearly as I can judge sixty or 69 per cent of the cases following an operation occurred after laparotomies It was more frequent after operations on the biliary system (occurring 15 times) than after any other operation on a single organ It occurred next in frequency (11 times) after operation on the kidney then came the operations on the appendix with five cases It followed curettage operation on the uterus ovariectomy herniotomy and operations on the stomach each four times It occurred eleven times after a variety of operations on the extremities

MacEwitt<sup>14</sup> says The successful completion of an operation paradoxical as it may appear is oftentimes but the beginning of a train of sequelæ which place the patient in a more hazardous state and the surgeon in one of perplex

ity and vacillating inactivity, where skill is thwarted by want of precedent and desire by doubt”

*Time of Onset After Operation*—This is difficult to ascertain, as the onset may be ill defined or the post-anesthetic vomiting may mask the onset. It varied from, “immediately after operation” to two weeks after operation (Robson’s case). It occurred the first day after operation in less than half the cases and onset was most frequent on the third and fourth day.

*The Anesthetic*—Of the twenty times where the character of the anesthetic was stated, twelve times it was chloroform and eight times ether.

*Following Trauma*—Traumatism was thought to be the cause seventeen times, with onset immediate or after a few days. Only five times was the force applied to abdomen, and in these the epigastrium was most often the part injured. In Edmund’s <sup>147</sup> case, patient was shot through dorsal spine, was paraplegic, and acute dilatation of the stomach came on thirty-four days later. Wenner <sup>121</sup> reported a similar case. In other instances the trauma was to thorax, head, spine, extremities, or the location was ill defined.

*Occurring During the Progress of a Disease*—Forty cases occurred while the patient was suffering from some more or less serious disease. Pneumonia led the list with six instances, then came appendicitis with four, carcinoma of the œsophagus, three,—abscess of the jaw, three,—localized tuberculosis, two,—miliary tuberculosis, two,—and brain diseases, two.

*Spinal Deformity*—With or without the application of a plaster jacket—In eleven cases, spinal curvature, of various types, was present, (cases of Perry & Shaw, Wichern,<sup>106</sup> Kirsch, Kelling, Kundrat, Schnitzler, Borchardt, Kausch, etc.) In five of these dilatation of the stomach was thought to be induced by the application of a plaster jacket.

Schnitzler and Kundrat both think a pronounced lumbar lordosis favors the occurrence of acute dilatation of the stomach, especially of the gastro-mesenteric type.

*Occurring During Convalescence*—Five cases occurred in patients convalescing from typhoid two followed acute rheumatism and one scarlet fever

Brinton<sup>17</sup> first called attention to the condition occurring with typhoid Prof Damaschino (quoted by Bremont<sup>4</sup>) Albutt (see his System) and others have pointed out its occurrence during the convalescence from grave fevers such as typhoid where it may be due to a degeneration of the muscles or nerves of the stomach associated with the widespread muscular and nerve changes so frequently met with in typhoid

LeGrand (a pupil of Bouchard) in his work *Dilatation de l'estomac et fièvre typhoïde* Paris 1886 says that people with dilated stomachs are particularly liable to typhoid and claims that typhoid leads to dilatation of the stomach In one of his cases a previously dilated stomach increased in size during typhoid while in another a gastric dilatation occurred during convalescence

Curschmann in his *Der Unterleibstyphus* in Nothnagel's Handbuch says he has not seen Acute Dilatation of the Stomach associated with typhoid

*Error in Diet*—Error in diet seemed to be the direct cause in twenty cases (*Dilatatio ex ingestis*) Patient having eaten very indigestible food or excessive amounts Grundzachs<sup>41</sup> case on a wager ate thirty hard boiled eggs drank some wine and immediately fell over on the floor in collapse T L Brown's case (cited by Bettman<sup>145</sup>) followed eating dried apples Nauwerk's<sup>145</sup> case had cherry stones in stomach Meat poisoning may have been a factor in cases of Friedenwald<sup>103</sup> and Simon<sup>30</sup> one after eating lobster and two after sausage but not in excessive amounts

*Drinking Large Amounts of Fluid or of Charged Drinks* Four times drinking large amount of fluid has been blamed but here as thirst is an early symptom it may be the effect and not the cause of the trouble Charged drinks especially a seidlitz powder taken by the patient as in Rogers<sup>10</sup> case or given by the physician to inflate the stomach may be the

cause of onset, as in the cases of Behrend,<sup>72</sup> Hoover<sup>173</sup> and Bastedo<sup>162</sup>

*Drugs*—Have been blamed by several Baumler<sup>90</sup> thought sodium salicylate and morphine caused his case Brémont's<sup>4</sup> case followed the taking of two grammes of laudanum and Neck<sup>25</sup> thought his case was due to veronal

*Emotional Causes*—Andral's<sup>80</sup> case followed immediately after a severe fright, and excessive laughing Schmorl<sup>110</sup> thought was the cause of the onset of his case

*A Chronically Dilated Stomach*, that suddenly ceased to maintain muscular tone was blamed in one case

*Health*—This was reported as perfect at the time of onset of trouble in a number of cases

*Previous Stomach Trouble*—This was inquired into in twenty-one instances and was found to have been present (often in light degree) eleven times, and absent ten times The stomach was carefully examined before the onset of the trouble and found normal in seven cases

*Second Attack*—Leugeu<sup>169</sup> reports a patient that had two attacks months apart, each after an operation on a kidney His patient responded to the stomach tube treatment Tuffier<sup>64</sup> reports a man who had two attacks, each after a slight trauma My one case had the second attack, or a relapse, a week from onset of first attack

*An Aneurysm*—This was the cause of Ewart and Jeffrey's<sup>59</sup> case, by pressing on the pylorus

*Tetany*—The complicated cases of Braun<sup>141</sup> and Broadbent,<sup>132</sup> and Wright's<sup>183</sup> case had muscular cramps Kussmaul<sup>70</sup> and Fleiner believe that gastric tetany in acute dilatation of the stomach is due to loss of water in the tissues and liken it to convulsive attacks seen in cholera asiatica and cholera nostras

*Traube's Space*—Enlarged and area of liver dulness reduced in a number of cases, and probably these signs are usually present and may be of great value in making a diagnosis

*Complicating Confinement*—Acute dilatation of the

stomach complicated a confinement in two instances Thomson's<sup>49</sup> case was due to an ovarian abscess rupturing during delivery causing a purulent peritonitis and acute dilatation of the stomach. One of my cases occurred less than an hour after delivery. She recovered from the first attack and had a relapse that was fatal a week later.

*Peritonitis*—May have been a causative factor in about six cases.

There is no doubt that there are mild often unrecognized cases as well as severe cases of acute dilatation of the stomach but most of the reported cases are severe ones.

*Symptoms and Physical Signs*—The most important symptoms are vomiting or nausea abdominal distension pain collapse stomach splashing constipation scanty urine and severe thirst.

*Vomiting*—This is one of the most important symptoms and usually the first to attract attention. It is present in about 90 per cent of the cases. It was stated to be absent in cases of von Herff<sup>100</sup> and Conner<sup>188</sup>. Edmunds, Dickerson and Borchardt do not speak of it as occurring in their cases. The most dismal cases are those in which vomiting does not occur as in these cases the stomach more rapidly distends and the condition is more easily overlooked. Von Herff's<sup>100</sup> second case belched but never vomited even to the fatal end. He was unable to pass even a stiff stomach tube as it stuck just before entering the stomach which he thought was due to a kinking at the cardia in consequence of the stomach dilatation as shown to occur by the experiments of Kelling<sup>108</sup> and Bruun & Seidel<sup>141</sup>. This kinking also explained the absence of vomiting. Vomiting may be present and then disappear for hours or even days only to return later. It has frequently been absent for quite a period before death. It has been described as regurgitant projectile persistent incessant uncontrollable profuse and like the pouring of fluid out of a sack (Bouvert). Henry Morris<sup>180</sup> says it comes up in large gulps without straining.



Chanannaz<sup>64</sup> and Lietaud call attention to the resemblance between the constant regurgitation of mouthfuls of fluid and the incontinence of urine seen with a distended bladder

The vomitus is usually dark greenish flocculent fluid, but may be black, brown or yellow, and be odorless, foul smelling, fetid or even fecal. It is probable that the black vomiting so often seen in very severe cases of appendicitis and peritonitis is often a symptom of acute dilatation of the stomach as Reynier<sup>64</sup> believes. The vomitus was fecal in character in the cases of Abbott,<sup>24</sup> Balster,<sup>148</sup> Braun,<sup>141</sup> Wichern,<sup>106</sup> MacEvitt<sup>142</sup> and Brémont.<sup>4</sup> A few times it was likened to coffee grounds. The quantity vomited has often been very great and strikingly in excess of the amount of fluid taken, as for instance Miller & Humby<sup>157</sup> reported that their patient vomited "five basinsful" during a single night.

A chemical examination of the vomitus was made in a number of instances and the results were as follows — Bile is usually present. No HCl was found in nine cases. Hyperchlorhydria was present in two cases. HCl was normal in amount in two cases. Lactic acid was present in seven cases. Yeast cells were found in four cases. Sulphurated hydrogen was noted in one case. Diastatic ferments were found once. One of Wichern's cases showed great numbers of bacterium coli, together with staphylococci and streptococci.

*Distension* — Distension of the abdomen is usually present, but it was looked for and found absent in five cases. It may affect chiefly the epigastrium or extend down the left side or involve the entire abdomen from ensiform to pubic bones. Tuffier's<sup>64</sup> case was so distended as to tear out all the stitches and allow the wound to gap, with no covering over the intestines for 15 days.

*Collapse* — Collapse, with hypocritic facies, is almost always present and usually occurs early, especially in the severe cases. It is probably referable to a number of things

such as over stretching of the stomach walls loss of the body fluids interference with the breathing and with the heart's action and innervation disturbances affecting the blood pressure and the vagus control of the heart A toxæmia may be a factor

*Pain*—Pain often severe was stated to be present in 25 cases and noted as absent in four cases

*Thirst*—Thirst may be as in my case an agonizing symptom It was reported present in 12 cases but probably is usually present

*Pulse*—The pulse at first may be normal Muller's case did not have at any time a pulse above 76 nor Kundrat's case above 90 The pulse usually becomes rapid early and when collapse occurs it assumes the features common to this condition It had a heart block like character in two cases seen by Hoover<sup>173</sup> Oppenheim thinks the pressure on the heart caused by the abdominal distension the chief cause of the collapse.

*Temperature*—Unless influenced by an associated infection the temperature is usually normal but is often subnormal

*Abdominal Tenderness*—Was stated to be present in nine cases and stated to be absent in twelve cases

*Constipation*—Was a prominent feature in most cases

*Flatus*—Was passed and this was often helpful in excluding intestinal obstruction in many cases

*Diarrhœa*—This was a prominent symptom with twelve cases

*Fluctuation*—Of abdomen was noted several times

*Succussion Splash*—Was obtained in the stomachs of nine patients probably it is usually present

*Visible Peristalsis*—Over stomach was stated to be present four times and stated to be absent twice It was probably often not looked for

Thomson speaks of the absence of visible peristalsis as an argument against obstruction either at the pylorus or duodenum but Mayo Robson<sup>184</sup> says peristalsis in any

part of the intestinal canal is never seen in acute obstruction, unless it supervenes upon a chronic impediment to the over-flow of fluids "

*Hypersecretion* —As emphasized by Morris,<sup>180</sup> was noted as a prominent symptom in seven cases

*Hiccough* —Attracted attention enough to be recorded eight times

*Cyanosis* —Was a prominent symptom in two cases

*Dyspnea* —Was severe in eleven instances

*Urine* —Was recorded seven times, as being scanty

*Duration* —This varied greatly from a few hours where cases were mild and treatment early and wise, to cases like Andral's<sup>8</sup> where the acute dilatation gradually became sub-acute and chronic. Perhaps four or five days was most often the duration. Many cases ended fatally almost immediately after onset

Albrecht<sup>1</sup> speaks of chronic cases of Arterio-Mesenterial Duodenal Compression and quotes Glénard and Kundrat as also believing that there occurs cases of incomplete or intermittent closure of the lumen of the intestine. Albrecht cites cases reported by Melbranc<sup>76</sup> and Weill<sup>77</sup> as belonging to this type

*Relapse* —Was noted in five instances. In my case it occurred a week after the first attack and caused a fatal termination of the case

*Diagnosis* —The first case seen by any observer has seldom been correctly diagnosed. By once seeing a case or by having the subject in mind, it may usually be recognized. Peritonitis has been the wrong diagnosis most often made. It may be differentiated by the absence of marked tenderness, a normal or subnormal temperature, succussion splash, no leucocytosis, no rigidity of the abdominal muscles, the frequent vomiting of large amounts of the characteristic greenish fluid which often relieves the distension and by passing the stomach tube. The Fowler position would be just the opposite to the one most favorable to recovery from acute gastric dilatation, but otherwise the treatment would

not be very different as washing out the stomach may help both conditions

It has been mistaken for a pancreatic cyst and the stomach opened a number of times but the passing of a stomach tube would quickly differentiate them. Uremia has been the diagnosis often wrongly made due to the vomiting and anuria but should be easily excluded by the stomach tube

It might be mistaken for gastrosuccorhea (Reichmann's disease) where we have in the acute variety a sudden onset with epigastric or dorsal pain gastric tenderness vertigo severe retching vomiting at longer or shorter intervals of large amounts of fluid slightly acid and bile-stained and great thirst. However here we do not have distension of the abdomen but rather the belly is sunken the collapse is less severe and the attacks stop suddenly leaving the patient with a sense of general well being. The stomach tube would here again help us

Intestinal obstruction has often been the wrong diagnosis and it is extremely hard to differentiate an intestinal obstruction high up in the alimentary tract say in the pyloric duodenal or upper jejunal region from acute dilatation of the stomach. In both conditions we may have distension of stomach. Vomiting and collapse following immediately after an operation or after an error of diet would point to acute dilatation of the stomach

In favor of intestinal obstruction would be a history of the trouble coming on slowly a long duration a cachexia a history of disease of the biliary system or symptoms pointing to a gastric or duodenal ulcer or to a neoplasm. The amount of relief afforded by the stomach tube would throw light on the diagnosis

Post operative ileus due to the formation of adhesions is very hard to separate from acute dilatation of the stomach if the obstruction occurs high up. The passage of the stomach tube will give the best aid

Other conditions that are similar to or have been mistaken for acute dilatation of the stomach are volvulus of

the stomach, (Cases of Wiesinger<sup>176</sup> and Streit<sup>193</sup>), pancreatic hemorrhage, a large gallstone acting as an obturator (Wiesinger's<sup>189</sup> Case) in the duodeno-jejunal region, congenital or hypertrophic stenosis of the pylorus (Coate's<sup>45</sup> case), retroperitoneal hernia, post-anesthetic vomiting, appendicitis (Korte<sup>159</sup>), chloroform poisoning (Schnitzler<sup>85</sup>), hematoma of the head of the pancreas, acute hemorrhagic pancreatitis (Gerhardt<sup>98</sup>), hernia through the diaphragm or into the fossæ duodeno-jejunalis, spasmodic closure of the pylorus, post-operative hematemesis such as Purves<sup>47</sup> has described, kidney colic, transient bilious vomiting, perforative peritonitis (Kelling<sup>108</sup>), ovarian cyst and gastric crises of tabes

It would consume too much time to enter into the differential diagnosis of each of the above conditions, but the chief reliance is to be placed on the result after passing the stomach tube, aided by the history and points of difference that will occur to anyone

*Prognosis*—The prognosis is not good, for of the 217 cases reported 135 (63.5 per cent) have died and but 77 (36.4 per cent) recovered. The outcome was not stated in five cases. It is probable that the mild cases are frequently overlooked and recover, while the serious or fatal cases are the ones to attract attention and to be reported in the literature. An early recognition of the condition and prompt and correct treatment must improve our statistics.

*Treatment—Preventative*—Albrecht advises a careful examination of the stomach for dilatation before all operations or anesthetics. Give no large meals while patient is in bed. Water should be given only by enema at first. Riedel<sup>123</sup> would give no fluid by mouth during the first twenty-four hours after an operation. Patients should be made to keep on side or on abdomen as much as possible. Riedel<sup>185</sup> advises in operating in the gastro-duodenal region, to make a large incision so the separation of adhesions and other manipulations can be more intelligently done. And one should keep in mind, as Stieda has pointed out, that the

manipulations in this region are near the solar plexus Robson<sup>74</sup> Cannon<sup>165</sup> and Crile have called attention to the danger of handling the stomach and pulling on the pylorus as this favors shock and gastro-intestinal paralysis due to the very abundant nerve supply from sympathetic and pneumogastric Walzberg<sup>159</sup> thinks the cooling of the viscera at a laparotomy as well as the handling sponging and gauze packing and the chilling and clotting of the lymph in the lymph vessels (which he has observed) all favor the occurrence of acute gastric dilatation

Muller has mentioned that purgatives before operation by emptying small intestine favor its prolapse.

As Borchard<sup>11</sup> has suggested one should use great care as to the amount of ingesta taken for the first five or six days Not too much liquid food on account of its greater weight When slight discomfort or belching nausea or uneasiness occurs do not delay but pass the tube into the stomach

*Active Treatment*—Stop all ingesta by mouth Pass stomach tube immediately no matter how moribund the patient seems If you are in doubt about diagnosis use tube remembering that even in peritonitis it is curative

Remember that Delbert<sup>170</sup> and many other observers think the so-called vicious cycle is really an acute dilatation of the stomach so use the tube in these cases

Tube should be passed far into the stomach so as to reach the bottom of the dilated organ which is often down as far as the pelvis and thus siphon the entire amount of fluid Neck<sup>112</sup> and Borchardt have emphasized this point and advise passing tube with patient in the elevated pelvic position and withdrawing the tube very slowly so as to get all the fluid out Tube should be passed very frequently

Postural treatment should be immediately tried as advocated by Muller<sup>33</sup> Schnitzler<sup>85</sup> Kelling<sup>108</sup> and Walzberg<sup>159</sup> who say one should have patient avoid dorsal decubitus position entirely and have them lie on abdomen or as long as possible assume the knee-chest position with

the weight partly supported by pillows Lying on the right side with the pelvis elevated, favors drainage through pylorus

Byron Robinson<sup>46</sup> found by experiment on the cadaver that pressure of the root of the mesentery on the transverse segment of the duodenum was greatest in the dorsal decubitus position and when the enteronic coils were in the pelvis He found that the abdominal position relieved the pressure, but not as much as the lateral position

The abdominal position, which seemed to have saved Schnitzler's<sup>85</sup> case appeared to make Borchardt's<sup>28</sup> patient worse, but in seven cases where it was used, five recovered

Nothnagel advised us, in order to produce first an antiperistalsis and later a strong peristaltic action, to use large salt-solution enemata (6 per cent salt) under pressure of 1½ foot above rectum, with pelvis elevated, and said that after twelve hours effort with clysters, if no fresh gall color is seen in the water expelled, one should try no longer to overcome kinking in this way, but should resort to laparotomy

Brown and Weill<sup>77</sup> both bound the abdomen tight, in their cases and with good results, and others have used pads as in treatment of ptosis

Mayo Robson<sup>46</sup> advises a gastrojejunostomy in desperate cases and says, "I would suggest that in every case of this kind, no matter at what stage it may be recognized, unless the patient be actually dying, the abdomen should be opened and the stomach emptied and connected with the jejunum, thus providing for continuous drainage into the intestines I believe that as yet this method has not been put to the test"

Byron Robinson<sup>46</sup> has reported a cure after this operation and thinks it should always be performed He also advises severing the duodenum on the right side of the mesentery vessels and securing it to the jejunum anterior to the vessels

Tschudy<sup>118</sup> seemed to have relieved his case by a gas-

tro-enterostomy antecolica but the patient died of pneumonia later Remond's case died after this operation had been performed to effect a cure of an acute dilatation of the stomach

The operative treatment is falsely based on the belief that most of the cases are due to a compression of the duodenum by the root of the mesentery or on the assumption that a gastro-enterostomy is a drainage operation. A compression of the mesentery was found in only 27 of the 120 cases autopsied so a gastro-enterostomy would but rarely be indicated to relieve a possible compression of the mesentery. Against the drainage idea we have the experiments of Kelling<sup>166</sup> and Cannon and Blake<sup>165</sup> which show that a gastro-jejunosomy is of little or no use as a drainage measure. This is borne out by clinical observations made by Mayo<sup>167</sup> Patterson<sup>194</sup> and others. Tuffier's<sup>64</sup> case occurred after a gastro-enterostomy and at autopsy both openings of exit were found patulous and yet an acute dilatation of the stomach had occurred. Kelling<sup>168</sup> thinks a gastro-enterostomy is useless for the stomach is too atonic to force the stomach contents through the artificial opening and cites Stieda's<sup>111</sup> experiment on a dog where two months after a gastro enterostomy posterior he produced by section of both vagi a gastric atony which caused an acute dilatation of the stomach and at autopsy the stomach was found filled with dark brownish green fluid and both openings of exit were patulous.

Schnitzler<sup>85</sup> advises against the suggestion made by some that the intestines be stitched in place for he fears there might be other obstruction of the intestinal lumen or circulation set up. Kelling<sup>166</sup> advises that the pelvis be tamponed to keep the intestines from entering it and adhesions will soon hold them up.

Many gastrotomies have been performed usually because the stomach has been mistaken for a cyst and all these cases have died (Watson<sup>3</sup> Brown<sup>135</sup> Apple<sup>73</sup> and Abbott<sup>4</sup>)

Furstner<sup>18</sup> reports three cases cured by induced electrical currents. Probably very mild cases. He advises us



to also use massage and joins Erdmann<sup>7</sup> in thinking cold applications to the abdomen are helpful

Of drugs, Box and Wallace<sup>63</sup> advise atropine as used in cases of ileus Riedel<sup>185</sup> uses morphine Muller crowds the administration of strychnine to the physiological limit

Bastedo<sup>162</sup> cured his case by apomorphine injections which emptied into the stomach Eserin salicylate in doses of  $\frac{1}{40}$  gr, hypodermically administered may be cautiously given

Salt-solution transfusions and enemata should always be used frequently and in large amounts to counteract the great thirst and collapse, and to relieve the fatal fluid starvation of tissue Its effect seemed magical to Haberland<sup>48</sup> in his case where he used transfusion It may be used to good advantage continuously by enema, as Murphy has advised for peritonitis, and Nothnagel, for mesenteric ileus

One should give restoratives and stimulants hypodermatically, as a matter of course

It is important to remember that after the condition is once established it constitutes a vicious cycle, the more the ingesta, or gastric secretion, the greater the pressure of the dilated stomach on the duodenum and against the small intestine, thus increasing the obstruction, etc

When fluids may be given by the mouth, advantage should be taken of the fact that even weak alcoholic or saline solutions are more readily absorbed and, as Cannon<sup>165</sup> has shown that proteid and fatty food remain longer in the stomach than carbohydrates of the same amount, so the first food should be a finely divided carbohydrate substance

*Death*—As Von Mering showed, no fluid is absorbed from the stomach and but little from duodenum, and as in acute dilatation of the stomach no fluid can reach the small intestine, there must be fluid starvation of tissue This may, as Kussmaul<sup>70</sup> and Fleiner believe, be the cause of the tetany seen in some cases Richardson says the mere deprivation of water, but for a few days, causes death, for if an animal has lost 22 per cent of its tissue-water, it dies

Oppenheim of Berlin thinks the mechanical interference with heart and respiration by forcing the diaphragm up is a most important factor in causing death. This view is supported by the numerous cases of death occurring after taking a seidlitz powder for medicine (Rogers<sup>10</sup> case) or for diagnostic purposes Hoover<sup>173</sup> but recently reported cases of tachycardia bradycardia and heart block like symptoms occurring after inflation of the stomach by a seidlitz powder.

Reynier<sup>170</sup> has shown that if you first ligate the cardiac and pyloric openings and then distend the stomach you cause an extreme fall in the blood pressure and Goltz arrested the heart in diastole by percussion of intestines.

Perhaps the absorption of toxins from the obstructed loop of the intestine or from the stomach is a cause of death for Clairmont and Ranzi showed that the filtrate of intestinal contents from a loop that is obstructed is toxic to animals while in cases where there is no ileus it is not.

Robson<sup>74</sup> and others have reported cases of rupture of the stomach and while this is probably rarely a cause yet it occasionally occurs. Death has occurred almost instantly (Rogers<sup>14</sup> Box and Wallace<sup>133</sup>) after a few hours or a few days or after a duration lasting as long as thirteen days (Braunler's<sup>99</sup> case).

*Morbid Anatomy*—Stomach is always found dilated and is the most striking feature seen at autopsy. It very often occupies the entire abdomen from costal arch to symphysis. In one case extending even into the true pelvis behind the pelvic arch. It is often U shaped or horse shoe shaped and fender spoke of its looking like a very fat arm flexed—upper part being cardia and fundus lower or forearm part being the pyloric end. Kirch likened stomach to a sack hung between pylorus and cardia. Volvulus of cardiac end was present once and of pyloric end once. (Thompson.)

Stomach was vertically placed in four of the cases autopsied. Walls were reported as thin in eight cases inflamed in one and thicker than normal in two cases.

Miller and Humby<sup>157</sup> found the muscular layers of the stomach atrophied and muscles separated so the mucosa was in contact with the serosa

Albu<sup>89</sup> found a gastritis parenchymatosa pigmentosa, and mucous membrane swollen, with brownish pigmentation Braumler<sup>99</sup> and Muller<sup>33</sup> found on the anterior stomach wall greenish spots of superficial necrosis

Brown,<sup>135</sup> Fagge,<sup>177</sup> and Hoffman<sup>58</sup> found small hemorrhages into mucosa Schultz saw a hemorrhagic infarct in his case

In many cases the microscopical examination of the stomach wall showed nothing abnormal

Bennett<sup>141</sup> found twisting of the œsophagus in his case

The pylorus was displaced downward in cases of Frankel,<sup>131</sup> Meyer<sup>75</sup> and Riedel<sup>32</sup> The pylorus was kinked in three cases

Riedel's<sup>185</sup> case had a band of omentum passing over pylorus and adherent to lesser omentum Stomach contents were largely gas in a number of cases, but usually consisted of large quantities of food, as much as two gallons Adhesions of pylorus to liver, and gall-bladder were reported once

Duodenum was dilated, to but a short distance and not up to the duodenal jejunal junction, in eight cases In four cases it is positively stated that there was no dilatation of the duodenum It was obstructed by a hemorrhage into its walls in one case

It was dilated up to where the mesentery crossed it, and here compressed by the root of the mesentery, in twenty-seven instances The small intestine below the duodenum was dilated, *i e*, in jejunum and ileum regions in five cases Duodenum was kinked in its upper part in four instances There were adhesions about duodenum in one case Duodenum was compressed by stomach in three cases (Muller,<sup>33</sup> Robson<sup>74</sup>)

Jejunum was obstructed by a large gall-stone in one case (Hochhaus<sup>95</sup>)

Floating kidney was thought to compress duodenum in Malbranc's <sup>76</sup> case

Small intestines were reported prolapsed into the true pelvis in twenty one cases

Therefore of the twenty seven cases where the dilatation of duodenum stopped at the point of crossing of the mesentery the small intestines were reported to be in true pelvis only in twenty one cases. It is well to remember as has been pointed out by several that it is not unusual for the small intestine to be in the pelvis where death has occurred from other causes

Braumler <sup>99</sup> was the only one to find any change in the tissue of the duodenal wall due to compression of the mesentery. He saw a superficial necrosis of the mucosa at point of pressure. He thinks it was necessary for the stomach weight to be added to the pressure of the mesentery in order to produce this necrosis

Peritonitis was present in four cases

**Conclusions**—Acute dilatation of the stomach is very fatal 63.5 per cent dying. It is not as rare as the literature leads one to believe. This is shown by the rapid increase in the number of cases reported since the subject has become better known

The pathology and *modus operandi* of acute dilation of the stomach and gastro-mesenteric ileus is not definitely known but the experimental clinical and pathological evidence points to a primary innervation disturbance affecting the gastric nerves or their centers in the brain or cord. It has not been proved that the compression of the duodenum by the root of the mesentery is the primary cause of the so-called arterio-mesenteric ileus

The diagnosis may usually be readily made by having the subject in mind especially where we have the presence of distension vomiting of large amounts of greenish fluid no rise of temperature rapid pulse great thirst little abdominal tenderness and increasing collapse. The passage of the stomach tube will usually establish the diagnosis

Treatment should consist of repeated gastric lavage even when the patient seems moribund. No food or drink should be given by the mouth, but salt-solution transfusions and enemata should be prescribed. Patient should avoid the dorsal decubitus position and assume the knee-chest, abdominal and right lateral positions as much as possible.

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# THE REMOVAL OF GALL STONES FROM THE SECOND AND THIRD PORTIONS OF THE COMMON BILE DUCT

BY F GREGORY CONNELL, M.D.,

OF OSHKOSH, WISCONSIN,

Associate Surgeon to St Mary's Hospital

THE removal of calculi from the gall-bladder was a recognized surgical procedure, when the removal of stones from the common duct was thought to be beyond the limits of the surgical art

Surgical invasion of the common duct was at the beginning confined to the supra-duodenal, or first division. Stones in the other portions of the common duct, or in the hepatic ducts, which could not be forced into the first portion were not removed

With the development of common duct surgery the terminal portions of the duct were invaded, through the duodenum by McBurney<sup>1</sup> and by Kocher,<sup>2</sup> and by the retroduodenal route, after mobilization of the duodenum, by Haasler<sup>3</sup> and others

The main hepatic ducts were next incised and even their finer ramifications have recently been successfully relieved of calculi (Hepatico-hepaticotomy, 1906, Hawkes<sup>4</sup>)

At the present writing it may be said that concretions have been and may be safely removed from any part of the biliary apparatus

The common bile duct is a tube approximately 3 inches (7.5 cm) in length, extending from the junction of the cystic and hepatic ducts, downward, and to the left to unite with the canal of Wirsung and terminates in the wall of the second portion of the duodenum, about 3½ to 4 inches from the pylorus

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It is divided into three portions 1st 2nd and 3rd. (1) The supra duodenal extends from its origin to the posterior surface of the duodenum where it comes in contact with the pancreas. This portion is from an inch to an inch and one half in length approximately half of the length of the entire duct—about 5.8 mm in diameter. With the hepatic artery some lymph glands and the portal vein it lies in the free border of the gastro-hepatic omentum which forms the anterior boundary of the foramen of Winslow. (2) The retro-duodenal or pancreatic portion is about an inch or an inch and one quarter in length and lies behind the duodenum either in a groove on the pancreas or is completely surrounded by pancreas. (3) The interstitial or transduodenal portion is about one-half to three-quarters of an inch in length and passes obliquely through the inner and posterior wall of the second portion of the duodenum. Its terminal portion is usually dilated the so-called diverticulum of Vater into which opens the duct of the pancreas the duct of Wirsung. This diverticulum may be absent but is present in about nine out of every ten cases. When present its average dimensions are length 6 to 7 mm and its diameter 4 to 5 mm. The duct opens upon the duodenal mucosa by a small opening about 2.5 mm. in diameter the narrowest part of the common duct.

The orifice is in a papilla this papilla may often be found by noting a longitudinal fold of the mucous membrane which is continuous with the papilla and is conspicuous among the transverse valvulae conniventes. It may better be located by the sense of touch as it feels like a small round shot in the mucosa.

Ascending infection is in a way prevented by the oblique insertion through the muscular wall of the duodenum and the presence of a sphincter muscle the so-called sphincter of Oddi which is an augmentation of the circular muscle coats of the duct.

Common duct obstruction is usually due to either malignant disease or to calculi which may be either biliary or pancreatic. Congenital stenosis has occurred.

The signs and symptoms are, as a rule, characteristic and consist of repeated attacks of colic, nausea and vomiting, high temperature, constant icterus gradually increasing after each attack, acholic stools. Between attacks, which may occur with marked regularity, most of the symptoms disappear, with the exception of the icterus and a tenderness in the epigastrium. There is a gradual loss of weight and no enlargement of the gall-bladder.

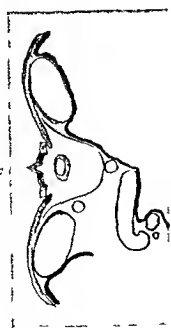
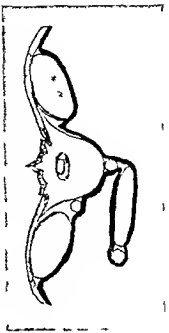
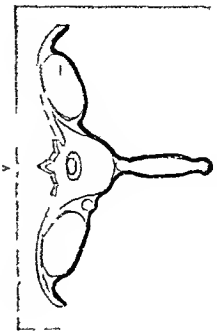
The differentiation between a stone and carcinoma may be made after a review of the history, and observation of the condition of the gall-bladder. Courvoisier's law has been found to hold true in about 80 per cent of cases, and is as follows: dilated gall-bladder occurs with malignant obstruction of the common duct, while a contracted gall-bladder will be found if the obstruction is due to cholelithiasis. The coincidence of calculi and malignant disease may give rise to confusion. Gall-stones are a most frequent cause of cancer of the gall-bladder, but not so of the gall-ducts. In 22 cases of carcinoma of the papilla, collected by Edes,<sup>5</sup> gall-stones were found only 4 times, and in 3 of these the stones were in the gall-bladder and only one in the common duct.

A differential diagnosis between biliary and pancreatic calculus as a rule, is not made, though Moynihan<sup>6</sup> has made a correct diagnosis of pancreatic calculus. The diagnosis is made chiefly upon the following points:

Colic less severe than biliary colic, diabetes, fatty stools, an absence or late appearance of jaundice, the passage of fragments of pancreatic calculi.

A differential diagnosis as to what particular portion of the common duct is obstructed is neither practical nor essential, a diagnosis of common duct obstruction by stone demands laparotomy and removal of the obstruction providing that the patient is in condition for the operation.

The treatment of stone in the common duct is surgical and consists of removal of the stone. Enlarged lymphatic glands may cause confusion in diagnosis as may disease of the pancreas, or malignant disease of the diverticulum of Vater.



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Even W J Mayo<sup>7</sup> mistook a carcinoma of the duct for a stone until it was exposed by incision of the duodenum and Fenger<sup>8</sup> did cholecystenterostomy for what was thought to be a carcinoma of the pancreas only at autopsy to find a stone in the ampulla of Vater. Similar errors have been recorded by others.

Concretions in the second and third portions of the common duct frequently escape detection and they are especially prone to be overlooked in cases in which stones are found in the first portion. Careful palpation of the second portion of the duodenum should always be carried out in all cases of common duct stones. If the lowermost stone removed from common duct is faceted at its distal end another stone should always be looked for.

Kuster<sup>9</sup> Fenger<sup>9</sup> Terrier<sup>9</sup> Laucenstein<sup>10</sup> Riedel<sup>9</sup> Haasler<sup>3</sup> Kocher<sup>10</sup> Zeller<sup>11</sup> and others report cases in which calculi in the diverticulum of Vater have been overlooked at operation. In the list of reported cases of transduodenal choledochotomy many have been operated upon previously with the removal of stones from the gall bladder or common duct. If a calculus is found in the lower portion of the common duct a judicious attempt should be made to force it back into the supra duodenal portion where it may be removed by simple choledochotomy.

This will usually be possible. In over 2000 operations upon the gall bladder or ducts the Mayos<sup>1</sup> have had to perform the transduodenal operation for the removal of stone in only 4 instances. In 100 cases recently reported by Kocher and Matte<sup>10</sup> they found it necessary in only 2 cases to approach the duct through the duodenum. Ochsner<sup>13</sup> in his experience has performed this operation twice and Murphy<sup>14</sup> not at all. This shows the infrequency with which impaction of the stone in the lower common duct occurs.

With a failure to force an impacted stone back into the first portion of the common duct an effort may be made to pass the stone out of the duct into the duodenum. This is rarely accomplished. Haasler<sup>3</sup> reports such an instance and Robson<sup>15</sup> mentions a case in which the stone passed into the

intestine during the manipulations of the operation, and was removed from the bowel by enterotomy. A similar case is mentioned by Pozzi<sup>16</sup>

An impacted stone in the lower portion of the common duct that resists reasonable effort to dislodge it, must be removed by either retro- or trans-duodenal choledochotomy. Attempts to crush or needle the stone are blind and unsatisfactory, lumbar choledochotomy is no longer employed. Cholecystenterostomy or cholecystostomy are merely palliative procedures as they do not remove the stone. Instances may be met with in which the condition of the patient will not allow of any prolonged operative manipulations, and it may then be advisable to establish a provisional or temporary drainage by cholecystostomy, and the obstructing stone may be removed at a subsequent sitting.

#### RETRO-DUODENAL CHOLEDOCHOTOMY

Retro-duodenal choledochotomy consists of an incision into the second portion of the common duct without opening into the duodenum. In order to accomplish this it is necessary to reflect the duodenum toward the median line, to mobilize the second portion of the duodenum as is done in Kocher's<sup>17</sup> gastro-duodenostomy.

This mobilization of the duodenum is a partial reproduction of the condition during embryonal life when the alimentary canal was a straight tube and the duodenum was supplied with a mesentery. The gradual changes from embryonic to mature conditions, with the loss of mesentery, by a blending of the right meso-duodenum and the primitive parietal peritoneum, after rotation of the first part of the small intestine, is well shown in the diagrams of Huntington<sup>18</sup> (Fig 1 A, B and C).

In D, which we have added to Huntington's plate, a common duct has been inserted and the principle of the mobilization of the mature duodenum is shown.

The technique consists of an incision through the posterior parietal peritoneum about an inch to the right of the descending duodenum. The posterior parietal peritoneum and the



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duodenum are separated from the retro-peritoneal structures to which they are attached in areolar tissue. This dissection is best made with fingers covered with gauze. In normal structures no difficulty will be encountered the bowel will be separated easily and as the blood supply enters mainly at the concavity of the duodenum the hemorrhage will not be excessive.

After freeing the viscus from the posterior attachments the rotation is made toward the median line with the hepatico duodenal ligament as a fixed point above and the left border of the duodenum over the head of the pancreas as an axis which brings the posterior surface of the duodenum with the common bile duct and the head of the pancreas into the field of operation (Fig 2)

Operations in which it is proposed to gain access to the second portion of the common duct by this rotation of the duodenum have been advocated by Oscar Block<sup>10</sup> Lane<sup>9</sup> Vautrin<sup>1</sup> Haasler<sup>4</sup> Berg<sup>1</sup> and Cooper<sup>23</sup>

In certain cases this operation is quite possible and even practicable and has been performed successfully many times but with the coincidence of acute or chronic inflammatory conditions or neoplasms of the head of the pancreas gall bladder or ducts stomach or liver it may be impracticable or even impossible. Even where these conditions do not exist the fact that the pancreas completely surrounds the common duct in two out of three cases necessitating a division of the pancreas is a point against the employment of this manoeuvre

As Binnie<sup>4</sup> well says "These operations seem better suited to the dissecting than to the operating room"

#### TRANS DUODENAL CHOLEDOCHOTOMY

The trans duodenal method consists of an exposure of the common duct by means of an incision through the anterior wall of the duodenum. One of the objections to this mode of approach is that there is greater danger of peritoneal infection because of the opening of the lumen of the bowel. But with increased experience and with improved technique the fear of opening into the intestine is rapidly disappearing

Theoretically there is but little difference, as regards infection, between a direct opening into the lumen of the bowel by a duodenal incision, or an indirect communication with the bowel lumen by means of an incision into the second portion of the common duct, which is directly continuous with the lumen of the gut, and in such a pathological condition that Nature's mechanism to prevent ascending infection is not effectual

Retro-duodenal incision of the third portion of the common duct, of course, would be practically an opening into the lumen of the duodenum, and the location of the opening is by no means as well suited for proper and secure closure as is the anteriorly placed incision

A distinction as to whether an impacted stone is in the second or third portion of the common duct cannot always be made

The duodenum is frequently incised for other pathological conditions, and other portions of the gastro-intestinal tract are incised daily without any great fear of infection. But of all portions of the bowel, it would seem from the experiments of Cushing,<sup>25</sup> that there is less danger of infections in operating upon the duodenum than on any other portion of the entire intestinal canal, as a preliminary starvation may render this part practically sterile

Another objection to the trans-duodenal method is that of a possible duodenal fistula with death from inanition, which has been emphasized by Berg,<sup>22</sup> who states that such a complication frequently occurs and is due, not to defective suturing as much as to a pathological condition of the duodenal wall, in that adhesions may deprive it of its serous covering

With secure and proper suturing, followed by rational after-treatment, the occurrence of fistula should be no more frequent in this location than it is after incision in other portions of the bowel. The position of the drainage and its relation to the suture line is all important. The drainage, if used at all, should be placed adjacent to, but not in contact with, the line of suturing

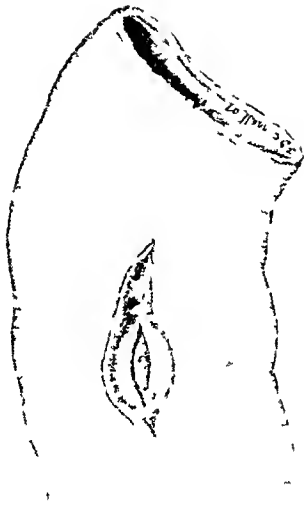
The technique of the operation itself, is as follows. A



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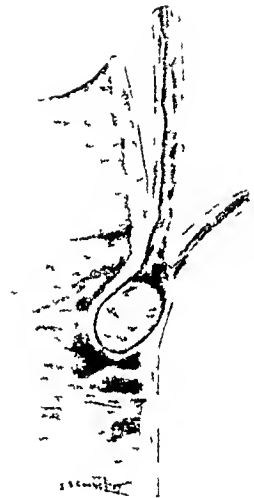


FIG 4



A

A —Incision of anterior duodenal wall, and mucosa of posterior duodenal wall, with exposure of stone in the diverticulum of Vater



B

B —Longitudinal section of common duct and duodenum showing stone in diverticulum of Vater

sand bag is placed under the back at about the level of the liver. The head of the table is raised about 6 inches. The Mayo Robson<sup>15</sup> or the Bevan<sup>6</sup> incision is made. A preliminary exploration of the gall bladder and adjacent structures is made. Gauze packs are inserted in the right kidney pouch and between the stomach and the ducts. Adhesions are separated and the foramen of Winslow opened. Rotation of the liver will be of great aid if operation upon the first portion of the common duct is necessary. This manoeuvre may tear the liver substance but such tears may be easily sutured with catgut and blunt needle.

As a rule it is not convenient to apply clamps to prevent the escape of intestinal contents and this is generally unnecessary as after proper preliminary treatment the duodenum will be empty. The stone and overlying structures may be grasped between a finger in the foramen of Winslow and the thumb over the duodenum.

The intestinal incision is made in the second portion of the duodenum parallel to its long axis (Fig 3)

After exposure of the common duct through the anterior duodenal incision the stone will usually be seen as an elevation or bulging beneath the mucosa of the posterior wall. The papilla the opening of the common duct may be visible below the stone at the upper extremity of a longitudinal fold in the mucosa conspicuous among the transverse valvulæ conniventes.

The calculus may now be removed in one of three ways according to its size and location. If in the diverticulum of Vater (third portion of the common duct) and is not too large it may be removed by the method of Collins<sup>17</sup> i.e. dilatation of the opening with forceps and delivery of the stone through the dilated but not incised opening of the duct. If in the same location but too large to be removed through the termination of the duct the McBurney<sup>1</sup> operation must be performed.

The papilla may be incised or the mucous membrane between the stone and the lumen of the duodenum directly over the stone may be incised sufficiently to remove the calculus (Fig 4 A and B)

The method of Collins is preferable, but is rarely possible because of the size of the stone, or the pathological condition of the termination of the duct, which will not permit of any considerable dilatation

Sutton<sup>28</sup> says that he has never found a stone larger than a cherry stone in the ampulla Moynihan<sup>29</sup> says stones in this location are usually the size of a split pea In the case reported with this contribution to the subject the stone was the size of a hickory nut Robson<sup>30</sup> reports a case in which a stone the size of a pigeon's egg was removed from the diverticulum of Vater

When the stone is impacted in the second portion of the common duct, the transduodenal operation will be that of Kocher<sup>2</sup> To remove a stone from this portion of the duct, the entire posterior duodenal wall will be incised, and in addition, the anterior wall of the common duct

After the removal of the stone it will be necessary to suture the anterior wall of the common duct to the posterior duodenal wall, thus forming an anastomosis between the second portion of the common duct and the duodenum (choledochoduodenostomia interna), in order to direct the bile into the intestine and prevent its escape into the retro-peritoneal space Undoubtedly, adhesions will often be found between these two surfaces, thus doing away with the necessity of suturing

The remainder of the operation is similar, in all, and consists of a thorough search for other stones They may easily escape detection, digital palpation with ungloved finger is to be recommended Kehr,<sup>31</sup> Mayo<sup>32</sup> and others, advocate the performance of a supra-duodenal choledochotomy and the carrying of a sponge through the second and third portions of the duct, in at the supra-duodenal opening and out through the duodenum (choledochusfege, Kehr) In this way one may rest assured that all the stones will be removed The hepatic and cystic ducts and the gall-bladder are to be explored very carefully

The incision in the anterior duodenal wall is now closed according to a recognized method of suture, care being taken

to have a secure union. The suture line may be made transverse to the line of incision (duodenoplasty) if stenosis is feared.

The next question is as to drainage. drainage is always indicated. The nature of the operation itself establishes good drainage into the duodenum but this is not considered as sufficient therefore a cholecystostomy is added or if the gall bladder is so contracted as to not be available as is sometimes the case with common duct stones then drainage may be established by choledochostomy. Either the one or the other is essential.

**SYNOPSIS OF CASE**—*Biliary colic and icterus one year ago. Second attack three months ago accompanied by symptoms of perforative peritonitis. Recovery. One week after attack a gall stone was passed per rectum since then characteristic symptoms of common duct obstruction.*

**Operation**—Gall bladder contracted with thickened walls numerous adhesions and enlarged lymph glands along the common duct. Mass in posterior walls of second portion of duodenum evidently in the diverticulum of Vater. Attempts to mobilize the duodenum for the purpose of doing retro duodenal choledochotomy abandoned because of adhesions and hemorrhage. McBurney's transduodenal choledochotomy performed with removal of calculus. Exploration of common duct negative.

Incision in anterior wall of duodenum closed. Cholecystostomy for drainage. Closure of abdomen. Recovery.

**History**—Female age 26 years housewife American.

**Family History**—Father has gall stones otherwise negative.

**Previous History**—No illness or accident. Has lived out of doors a great deal. is an enthusiastic equestrienne. menstrual history negative. Has been married 7 years and is the mother of 2 children both labors and puerperia normal. With the exception of an attack of gall stone colic one year ago which confined her to bed but a few days the previous history is negative.

**Present Illness**—Began July 27 1906 with an attack of hepatic colic in which she was attended by Dr Geo E. Newell of Buena Vista Colo.

After the administration of morphia followed by laxatives

and enemata, she was better until the night of July 28th, when she had another severe colic with vomiting, a chill, temperature 104 F, pulse 140 and amaurosis followed by a stuporous condition. Jaundice was present but not marked. I first saw the patient with Dr Newell at about midnight, six hours after the onset of the attack, when she was in better condition, complained of no pain, temperature 100, pulse 130, there was rigidity of the abdominal muscles of the right side, tympanites and tenderness on pressure over the region of the gall-bladder, she was still in a semi-stupor.

Immediate removal to the hospital was advised, but was not consented to. She remained about the same, with a gradual improvement in her mental condition and amaurosis, until the next night, July 29th, when she had another attack of pain with chill, temperature 105, pulse 150, complained of blindness and again fell into a semi-comatose condition. Tympanites, tenderness and rigidity were marked. Her bowels had moved by the aid of enemata, urine was normal with the exception of the presence of bile. This condition lasted about six hours, and preparations were being made for her removal to the hospital when she suddenly improved, and within 12 hours from the beginning of this attack her pulse and temperature were normal, consequently she did not enter hospital at this time. Gradually improvement followed and a week after the onset of the symptoms she passed, per rectum, a gall-stone about the size of a bean.

She then was up and around, was irregularly jaundiced, but never free from jaundice, had acholic stools at times, nausea and vomiting became constant after meals, with marked gas formation. She had irregular temperature, but no chill. Constant pain and tenderness in epigastrium with loss of weight. Gastric lavage gave slight relief for a time, but as the symptoms persisted and became gradually worse, she finally submitted to operation, for the removal of stone from the common duct.

*Operation*—October 1, 1906, D & R G R R Hospital, Salida, Colo. M E Connell of Chicago and G E Newell of Buena Vista, Colo., present. Ether administered by Dr Harding, Dr Johnson assistant. The Mayo Robson incision was made with the patient in the reversed Trendelenberg position.

There were numerous adhesions to gall-bladder, pylorus normal, gauze packs were inserted into the right kidney pouch and to the median line of the common duct. The gall-bladder was

shrunk with thick walls and of a dark yellowish color no stones were palpable. The adhesions were broken up and the gall bladder and bile ducts exposed. The finger was inserted into the foramen of Winslow the gastro-hepatic omentum was thickened and some enlarged and hardened glands were palpated one of which was removed. The liver was rotated and in doing so the liver substance was torn.

In the second portion of the duodenum a mass about the size of a hickory nut could be palpated. This was located in the posterior wall of the duodenum evidently a stone in the diverticulum of Vater. The stone could not be forced back into the supra duodenal portion of the duct nor on into the duodenum. An attempt to mobilize and rotate the second portion of the duodenum was made in this way aiming to bring the posterior surface of the duodenum and the common duct into the field of operation that is to do a retro-duodenal choledochotomy. An incision was made through the parietal peritoneum about 1 inch to the right of the descending duodenum but blunt dissection toward the median line was accompanied by so much hemorrhage and was so difficult that it was abandoned. Therefore transduodenal choledochotomy was performed. With the stone and the overlying duodenal wall held between the thumb and forefinger of the left hand the anterior wall of the duodenum was incised longitudinally in about the midline. This incision opened the lumen of the duodenum and exposed the posterior wall with the stone forming a prominence beneath the mucosa of the posterior wall.

The papillary orifice of the common duct was not distinguished. While the position of the left forefinger and thumb remained the same a second incision was made directly over the stone through the posterior mucosa exposing the stone (Fig 4 A). Forceps were then inserted which grasped and removed the calculus which was followed at once by the escape of bile. The common duct was explored but no other stones were detected. The duodenal mucosa was not sutured. The incision in the anterior duodenal wall was securely closed with a single row of through and through sutures of Pagenstecher. The line of union was examined and cleansed with moist sponges. The tear in the liver was repaired with a mattress stitch of catgut. A typical cholecystostomy was next performed and the abdominal wound closed below the drainage tube. Convalescence was uninter-

rupted, and when last heard from, 9 months after operation, the patient was in perfect health

In a review of the literature we find that Kocher,<sup>34</sup> in 1899, was able to collect 20 instances in which the common duct was opened through the duodenum

In 1902 Thienhaus<sup>33</sup> added 9 to the list, and in January, 1906, Hancock<sup>34</sup> was able to collect 60 cases in which calculi were removed from the common duct in this manner

I have been able to gather, with more or less detail, 77 instances in which this operation was carried out Cases in which malignant disease was found are not included, nor are simple duodenotomies in which no stone was found in the duct, or in which the stone was found free in the lumen of the bowel The cases are as follows McBurney,<sup>34</sup> 11, Kocher,<sup>10</sup> 2, Robson,<sup>30</sup> 21, Moynihan,<sup>35</sup> 8, Kehr,<sup>38</sup> 5, Mayo,<sup>12</sup> 4, Sprengel,<sup>36</sup> 4, Ochsner,<sup>13</sup> 2, Ferguson,<sup>33</sup> 2, Robinson,<sup>37</sup> 2, Petersen,<sup>38</sup> 2, Czerny,<sup>38</sup> 1, Langenbuch,<sup>38</sup> 1, Terrier,<sup>38</sup> 1, Hoffmann,<sup>38</sup> 1, Pozzi,<sup>16</sup> 1, Haasler,<sup>3</sup> 1, Thienhaus,<sup>33</sup> 1, Dalziel,<sup>39</sup> 1, Tinker,<sup>40</sup> 1, Page,<sup>41</sup> 1, Hancock,<sup>34</sup> 1, Lagoutte,<sup>42</sup> 1, Sherk,<sup>43</sup> 1, Connell, 1 Total, 77

In the 77 cases above cited there were 10 deaths McBurney 2, 1 due to hemorrhage, 1 due to vomiting, Robson 5, 1 due to acute dilatation of stomach, 1 due to sub-diaphragmatic abscess, 1 due to pyæmia before operation, 1 due to duodenal fistula, 1 due to cause not mentioned, Moynihan 1, due to hemorrhage, Sprengel 1, due to duodenal fistula, Kehr 1, due to cholæmia and hemorrhage Total, 10

In all but the two cases in which duodenal fistula occurred the result could not be attributed to the method of the removal of the calculus

The mortality rate is higher than that following simple supraduodenal choledochotomy, which is between 2 per cent and 3 per cent But the transduodenal operation is always a method of necessity and never of election But it may be necessary during any operation on the gall-bladder or ducts

In a farther analysis of these cases one finds that 12 cases

occurred in males and 38 in females. As regards the ages 4 were operated upon at ages between 25-30 3 between 30-35 10 between 35-40 5 between 40-45 10 between 45-50 4 between 50-55 8 between 55-60 3 between 60-65 2 between 65-70.

That stones in the common duct especially its terminal portion are frequently overlooked during operations upon the gall bladder or upper parts of the duct is well shown by the fact that in 10 instances mention is made of a previous operation on the bladder or ducts with or without removal of stones. In 31 cases single stones were removed from the ampulla in 17 cases two or more stones were removed from the ducts. In 3 instances the calculi were pancreatic.

In 1 case the stone was the size of a pigeon's egg 1 of a walnut 1 of a hickory nut 3 of a grape 2 of a hazel nut 4 of a cherry 3 of a pea. In 7 cases mention is made of futile attempts to mobilize the duodenum for the purpose of performing retroduodenal choledochotomy.

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# THE REDUCTION EN MASSE OF STRANGULATED AND NON STRANGULATED HERNIÆ

BY EDRED M CORNER, M C (CANTAB) F R C S (ENG)

OF LONDON ENG.

Surgeon to St Thomas Hospital and to the Children's Hospital  
Great Ormond Street Children's Hospital

AND

A B HOWITT M B B C (CANTAB)

OF LONDON ENG

Lecturer in Surgery and Casualty Officer St. Thomas Hospital.

THERE are certain clinical events which are of sufficient rarity to occur perhaps only once or twice in the practice of any one man. No one in consequence has sufficient experience of such occurrences to become an authority and our knowledge of these subjects is only increased by collecting into a convenient form the opinions and observations of others. This must be done from time to time so as to maintain the knowledge gained from this collective investigation up-to-date. With regard to the subject of the reduction of herniæ *en masse* we have set ourselves the task of publishing five or six new cases and of setting forth the accumulated experience of others. But beyond this comparatively unambitious task we desire to state the classes of case in which we think reduction *en masse* will be found of such common occurrence that every surgeon will see at least half a dozen such cases pass beneath his notice in the course of a year. Thus we would urge that events which are rare in their extreme form are much more frequent in their lesser degrees: in fact they may form no negligible part of the material which passes through every surgeon's hands and have been overlooked until revealed by the study of the rarer events which compel attention being given to themselves. Therefore we would urge that there is a practical lesson of frequent applicability suggested in this paper.

Reduction *en masse* has only been recognized hitherto in its acute form, viz —the reduction *en masse* of a strangulated hernia. A very considerable knowledge of these acute forms has collected, which we present as follows —

#### ACUTE REDUCTION EN MASSE

*Frequency*—During the years 1894–1906 there were 883 cases of strangulated hernia admitted to St Thomas' Hospital and in the same period three cases of reduction *en masse* occurred, giving the frequency as 1 in every 294 cases. At St Bartholomew's Hospital, between the years 1890 and 1905, there were admitted 735 examples of strangulated hernia, and two of reduction *en masse*, giving a frequency of 1 in 368. Combining these figures it is found that for 1618 cases of strangulated hernia the frequency of reduction *en masse* is 1 in 331, approximately 3 per cent. In a paper<sup>1</sup> "Gangrene in Strangulated Herniæ" in St Thomas' Hospital Reports, 1900, it was shown that 14 per cent of the cases of strangulated hernia admitted to the hospital escaped operation by undergoing reduction, the remainder, 86 per cent, did not undergo reduction. It will therefore be appreciated that reduction *en masse* is a very rare event, because it forms only a minute percentage of the 14 per cent of the cases admitted as strangulated herniæ in hospital practice.

In all, we examined the records of 137 examples of the reduction of a strangulated hernia *en masse*. The results of which we propose to state briefly in "Registrar Form". Unfortunately all details are not given in every case, so that the numbers do not add up to 137.

*Sex*—Males, 110, 86 per cent. Females, 18, 14 per cent.

*Side*—Right, 68, 64 per cent. Left, 39, 36 per cent.

*Region*—Inguinal, 113, 83 per cent. Femoral, 22, 16 per cent. Obturator, 2, 1 per cent. Umbilical, 0.

*Results*—Inguinal. Recovered, 59, 52 per cent. Died,

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<sup>1</sup> Edred M. Corner, Gangrene in Strangulated Herniæ, S. Thomas' Hospital Reports, 1900, pp. 341–369.

54	48 per cent	Femoral	Recovered	6	28 per cent	Died
16	72 per cent	Obturator	Died	2	100 per cent	

It is a curious fact that no example of the reduction *en masse* of an umbilical or ventral hernia should have been recorded as there is no reason why they should be exempt. The records for the inguinal herniæ differ markedly from those of the femoral variety in having a mortality of 48 per cent as compared with 72 per cent bearing out the fact that all through their clinical variations femoral herniæ have a graver prognosis than do inguinal herniæ.

*Method of Reduction En Masse*—By medical man 50 per cent by patient 28 per cent. uncertain 18 per cent spontaneously 4 per cent

The accident occurs most frequently through the injudicious taxis of the medical man a grave charge. A further point of interest is that it can occur spontaneously. One of the best examples of this is recorded by Dr Tonking of Camborne Cornwall England who found the bowel reduced *en masse* from an obturator hernia when performing an abdominal section for intestinal obstruction (*Lancet* 1904 ii 917-918)

#### DURATION OF HERNIA PREVIOUS TO ITS REDUCTION EN MASSE.

On this point it was possible to find a statement in approximately 100 cases enabling the accompanying table to be made up

Within	24 hours of its appearance	8 per cent
Within	1 year of its appearance	2 per cent
Within	1-2 years of its appearance	2 per cent
Within	2-3 years of its appearance	3 per cent
Within	3-4 years of its appearance	4 per cent
Within	4-5 years of its appearance	3 per cent
Within	5-10 years of its appearance	7 per cent
Within	10-15 years of its appearance	15 per cent.
Within	15-20 years of its appearance	7 per cent
Within	20-30 years of its appearance	11 per cent
Over	30 years of its appearance	18 per cent
Years	after its appearance	20 per cent

The hernia in which reduction *en masse* occurred of the oldest standing was 62 years, that of the shortest was "a few hours" It would thus seem that the accident of reduction *en masse* occurs most often in herniæ of old standing but that it can take place at or shortly after the formation of the hernia Indeed it is more frequent then than in any year up to the fifteenth or even the thirtieth during which it has been present These early examples do not necessarily occur in the youngest subjects For example one man was 48 years of age when he suddenly developed a hernia which was strangulated and reduced *en masse* shortly after its formation

*Age*—The average age for reduction *en masse* to occur was 47 The youngest subject was 13 years of age and the eldest 79

Between 10-20 years of age,	5 per cent
Between 20-30 years of age,	7 per cent
Between 30-40 years of age,	19 per cent
Between 40-50 years of age,	25 per cent
Between 50-60 years of age,	20 per cent
Between 60-70 years of age,	17 per cent
Between 70-80 years of age,	7 per cent

Thus it is the older subjects which are the most liable to this accident

#### CONTENTS OF HERNIA

In this series of *acute* cases the viscus which had been reduced *en masse* was almost invariably *small bowel* In the latter part of the paper we hope to show that the *subacute and chronic* cases will be found amongst the herniæ which contain *omentum, large bowel or bladder*

We now report the four examples of the condition which have been in the St Thomas' Hospital since 1900 Two recovered, one died, and another which died also illustrates the practical difficulty of dealing successfully with a newly formed sac and a tightly strangulated partial enterocele at an operation

CASE I—*Strangulated Inguinal Hernia, Reduction en masse*

by patient *Operation Recovery* G C aged 45 stableman admitted 22nd January 1900 under the care of Mr Betham Robinson Discharged 4th February 1900

*Past History*—Ten years ago had a fall which he thinks caused the rupture on the right side as the hernia came down soon afterwards Sometimes he has had a little trouble in reducing it He has never worn a truss

*History of Present Illness*—Usually on going to bed hernia went back of its own accord On 18th January 1900 patient found hernia only a little way down but it caused him considerable pain He tried to get it back but does not think he had any effect on it During night he was very sick and since this time up to time of admission has had great pain and been sick several times On night of 18th bowels were freely opened but had not been opened again up to the time of admission and he had not passed any flatus per rectum from that night up to the time of admission

*On Admission*—Patient was rather collapsed pulse 80 and weak and respirations 24 Temperature 97.4 Extremities cold A lump was to be felt in the abdomen in the region of the appendix but there was very little if any distention Inguinal canal empty

*Operation*—Incision along outer border of R Rectus It was found that obstruction was caused by a band of peritoneum constricting a knuckle of gut This band was wide and firm stretching from the posterior wall of the hernial sac just within its mouth upwards inwards and backwards to the posterior parietal peritoneum The sac had apparently been drawn up and inverted The constricting band was then divided The sac was cleared of all its attachments ligatured and cut away During the operation the patient's condition remained good

Jan 23—Condition much improved feels quite comfortable and free from pain Bowels have been twice opened

Jan 31—Stitches removed Healed by first intention Since the operation patient has been quite comfortable and feeling very well Bowels regular

CASE II—*Strangulated Inguinal Hernia Reduction en masse of a partial enterocæle Operation Recovery* C. C. aged 52 pointsman Admitted 19th November 190 under the care of Mr Betham Robinson Discharged 6th December 190

*History of Present Illness*—Patient has had a rupture for ten years On Nov 19th patient was lifting a weight and the rupture slipped down He attempted but failed to get it back—the pain was very great Three hours after, a doctor saw him and, after half an hour's taxis, succeeded in reducing the hernia He vomited three times before admission, bringing up bile colored fluid Patient vomited three or four times while in hospital before the operation The bowels have not been opened

*Examination*—There is a lump to be felt deep in the abdominal wall, opposite the internal ring The rest of the belly is lax and moves well

*Operation*—Incision made parallel to Poupart's ligament on right side over external ring External oblique divided, on dissecting further down, the sac of the hernia with its contents forced itself up It had a distinct neck and on opening it up, was found to contain some gut The constriction was severed, and the bowel slipped back The bowel on inspection showed an oval area, about the size of two pennies, involving only one aspect of the bowel, which was roughened by inflammatory lymph and of a darker color than the rest Bassini's operation Recovery

CASE III—*Strangulated Inguinal Hernia, Reduction en masse by patient, Operation, Perforation of the bowel, Death* H M, aged 37, stone carver Admitted 25th January, 1907, under the care of Dr Edred M Corner Died 31st January, 1907

*Past History*—Patient has had a rupture on both sides for many years On right side for about ten years and on the left for longer Patient has worn a truss

*History of Present Illness*—Four days ago the left hernia came down when the truss was on and patient was seized with severe pain in the abdomen, and returning into the scrotum on coughing The hernia on the right side, which was much the smaller, the patient reduced himself with difficulty on the following day, he was sick two or three times and continued to have pain, and on the fourth day, being again sick and still having abdominal pain he came up to the hospital in the evening

*State*—A thin and weak looking man of 37, looking older than his years and with a very alcoholic history On the left side a large scrotal hernia, which can easily be reduced, and comes down again on coughing On the right side there is no hernia

to be felt Abdomen rather distended and slightly tender on palpation though not more so in one region than another Movement on respiration good Furred tongue pulse 108 respiration 30 temperature normal Patient has passed nothing per anum except a small amount of flatus for 4 days A simple enema was given with good result The patient was more comfortable the vomiting ceased and the pulse rate fell to 96

Jan 26—During the morning patient became more uncomfortable again and started vomiting A turpentine enema was given with no result His pulse rate rose to 112 and he was taken up to the operating theatre at 3 P M

*Operation*—A laparotomy was performed and on opening the peritoneal cavity collapsed small bowel was seen It was found that a piece of small bowel was strangulated and reduced en masse in the hernial sac on the right side The neck of the sac was cut and the piece of bowel set free It was dark in color and recovered somewhat in tone the peritoneum was glistening and intact At the two parts where the bowel had been constricted there was a grayish line surrounding the gut which did not recover much on exposure The patient's general condition was very bad and it was impossible to undertake a resection of the damaged part of the intestine or to perform a radical cure for the hernia The intestine was returned to the abdomen and the laparotomy wound closed

On recovery from the anesthetic patient was much more comfortable and four hours after the operation had a loose stool During the next four days patient progressed favorably He was comfortable was not sick at all and seemed to be going on well He had 3 or 4 stools each day loose in character but becoming more solid and on the 5th day he passed a formed motion His pulse varied between 92 and 104 and his temperature remained slightly subnormal On the fifth day soon after 4 P M he began to have abdominal pain Between then and 8 P M he was sick four times and his pulse rose to 112 Before going up to the operating theatre it had risen to 15°

Jan 31—*Operation*—It was found that the bowel had perforated at the site of one of the constricting bands The patient's condition was too bad to undertake a resection and the perforation was rapidly sewn up and the peritoneal cavity wiped out with dry plugs of gauze and the abdominal wound closed up



An intravenous infusion was performed in the ward, but the patient died about 2 hours after the operation

*Post-Mortem Examination*—On opening the abdomen, distended coils of gut were seen. There was a moderate amount of recent peritonitis, and lymph was seen in places glueing the coils together. The pelvis contained dark turbid fluid. The intestines were reddened and a little injected. In the ileum was a small patch of gangrenous, black intestine. It was about one inch in diameter and was attached by stitches on two sides to the gut above and below it. The gut above and below it was covered by a thin coat of lymph, but was not discolored. The small intestine above this patch was distended. Below it, the intestines were small.

CASE IV—*Strangulated Femoral Hernia, Partial Enterocoele, Reduction en masse of the enterocoele at the operation, secondary operation, Death* S D, aged 39 Female Married Admitted December 28th, 1901 Died 2nd January, 1902

*Family History*—Patient's mother had a double rupture. Her sister had a rupture which eventually became strangulated and for which she underwent an operation.

*History of Present Illness*—Three days before day of admission patient noticed pain in left groin on coming downstairs and found that a lump had appeared. The hernia was on this occasion reduced by a doctor, but came down again late at night on the day before admission. On the following day the doctor was again sent for but failed to reduce the hernia, and the patient was admitted to St Thomas' Hospital at night.

*State on Admission*—A tense, rather elastic swelling is to be seen and felt in left groin over site of crural canal, about 1 inch in diameter. The swelling is tender on examination, and irreducible, and the patient is suffering a good deal of pain but is not collapsed. Pulse 118.

*Operation, 28th December*—Sac of recent origin found, containing small loop of congested small gut, partial enterocoele. Sac was torn in reducing contents. Radical cure by Parry's method. Symptoms of obstruction persisted after operation, although 3 enemata gave good results, and flatus was passed. After operation pulse fell to 82 but began to rise again on 4th night.

*Operation, 2nd January* Abdomen opened through rectus

(left) and the previously herniated loop found to be *partially* strangulated by neck of sac hence the passage of flatus and the good results of 3 enemata. Patient became very collapsed. Intravenous saline infusion given. Death occurred few hours after operation.

*Post Mortem Examination*—Early general peritonitis. Small intestine distended. Point where gut had been strangulated was 24 inches above ileocecal valve. Below this the bowels were collapsed. Viscera healthy.

#### EXAMPLES OF THE REDUCTION EN MASSE OF HERNIA WHICH ARE NOT STRANGULATED

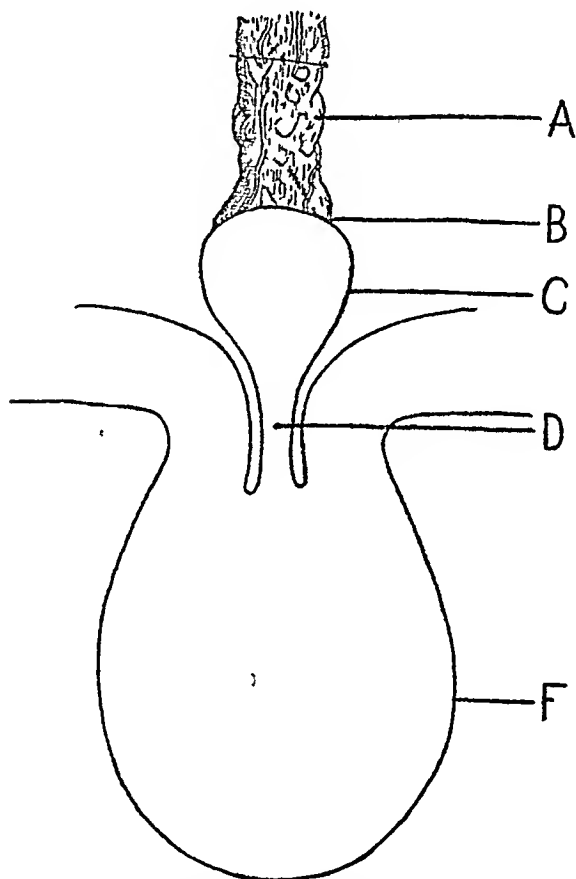
Hitherto it has only been the practice to recognize cases of acute reduction *en masse* but cases of subacute or chronic reduction *en masse* are plainly recognizable particularly when the contents of the hernia are other than small bowel. We quote cases to illustrate this.

**CASE V—Omental Hernia** Operating upon a young man of 25 years of age in 1905 for a condition diagnosed as a reducible inguinal hernia one of us came across a condition of affairs which gave us the first clue to cases of the subacute or chronic reduction *en masse* of an omental hernia. The hernia came down every night and the patient was in the habit of reducing it (*en masse*) and wearing a truss. At the time of the operation the hernia was reduced. After opening up the inguinal canal the sac was opened and in it was found a roll of tissue surrounded with peritoneum which extended from the fundus of the sac to the abdomen (Fig. 1). On pulling on this cord of tissue a piece of omentum adherent to its abdominal end was withdrawn from the abdomen. The mystery was solved the hernia was down (Fig. 2). It is an obvious inference that the patient was in the habit of reducing this omentum with part of the sac every morning when replacing his hernia prior to putting on his truss.

We were led to this explanation by finding the curious involution of the sac but the case certainly suggests that similar reduction *en masse* can take place in many instances in which the omentum is adherent to the sac, which suggestion our further observations have confirmed.

*Large Bowel Herniæ*—When operating on right sided herniæ it is not infrequent to find that the cæcum has slipped down from the abdomen, behind the peritoneum, so that it has no complete covering of peritoneum. It is then termed a hernia *en glissade*. Yet in some of these instances the patients reduce the hernia and part of the sac with it daily, before put-

FIG 1



Reduction *en masse* of omental hernia and sac (A) Omentum, (B) Adhesion between omentum and sac, (C) Inverted and reduced normal sac, (D) The wall inside the part of the sac which remains in the scrotum, (F) It is inverted by the reduction of the omentum (A) and the adhesion (B)

ting on their truss. On the left side a similar condition is found, the lower part of the sigmoid coming down into the hernia when it is incompletely surrounded with peritoneum. In this case also the patients are often in the habit of reducing the hernia *en masse* before putting on the truss. Further than

that the surgeon when operating removes part of the sac sews up the rest and reduces the hernia *en masse* before commencing his radical cure.

Recently we had a good example of this before us. A man came to the out patients at St Thomas Hospital with an irreducible inguinal hernia on the left side. He was admitted but allowed to remain in bed as there were no symptoms of strangulation. The hernia became reduced spontaneously.

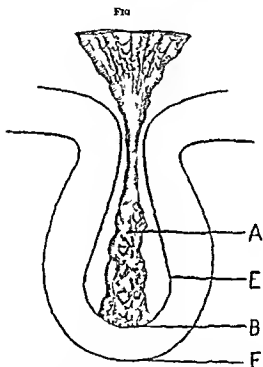


FIG. The ment hernia d wul th ext erted sac. (A) Th omentu (B) I dhesion t th f d (C) Th sa (E) Th hernia i th scrot m i erted d dit bed (F) Th scrot m

In the out patients one of us had seen the nontranslucent rupture extending to the bottom of the scrotum. At the operation we only found a sac an inch long! On opening the sac a mass of fat covered with peritoneum and like an appendiceal epiploica was seen at its neck. By pulling on this mass of fat the large bowel the colon was easily brought into view. In this case there can be little doubt that the patient when first

seen, had a hernia *en glissade*, the colon forming part of the wall, extending to the bottom of the scrotum, which became reduced spontaneously. We would also like to urge that the significance of a pad of fat at the neck of the hernia (Fig 3) is that there is large bowel in the proximity which can, if it has not already, come into the hernia *en glissade*. These pads of fat are not at all infrequently seen during the course of hernia operations and are of some use in putting the surgeon on his guard to avoid the danger of ligaturing part of the large bowel with the sac.

Spontaneous reductions *en masse* are by no means infrequent in children. A number of cases are sent up to the Children's Hospital, Great Ormond Street, as strangulated herniæ, but it is only a small percentage of these which come to operation, the remainder becoming reduced, such as with an ice bag. Considering the frequency with which the cæcum is found in the irreducible herniæ of children, there can be no doubt that some of these cases are examples of the reduction *en masse* of a hernia *en glissade*. Thus there is an intimate connection between all herniæ which arise *en glissade* and the question of their reduction *en masse*.

*Bladder Hernia*—There is one further viscus to which we would like to direct attention in connection with the reduction *en masse* of parts of unstrangulated herniæ, namely, the bladder. Every surgeon knows that it is quite common to be able to draw the bladder into the sight during an operation for inguinal hernia by traction on the sac. Again it is not uncommon for the bladder to be at or outside the internal abdominal ring, and in certain cases where there has been a definite bladder hernia, the patient has been in the habit of reducing it (*en masse*) before putting on the truss. As an example of this may be quoted a case recently in the Children's Hospital, Great Ormond Street. A little boy had a right sided hernia, perfectly reducible, which used to be replaced in the abdomen, before putting on his truss. At the operation for the radical cure of the hernia, it was found that the protrusion consisted almost entirely of bladder. Hence it was a case of the habitual reduction *en masse* of a bladder hernia.

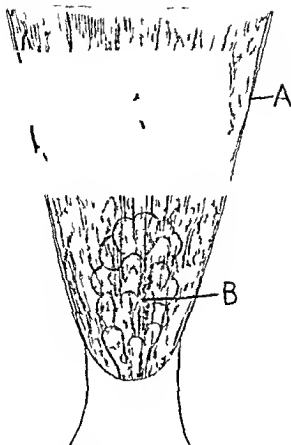


FIGURE 3. (A) The right iliac crest. (B) The uterus. The diagram shows the relationship between the uterus and the iliac crest.



The question may arise as to what distinction we make between the reduction of the contents of an ordinarily reducible hernia and the reduction *en masse* of a subacute or chronic hernia. It is this. In the reduction of the contents of a reducible hernia the contents alone are reduced the sac remaining outside whilst in the latter case both the contents of the sac and the sac are reduced the sac wholly or partially according to the degree of reduction *en masse* present. The reduction of a hernia *en masse* is most dangerous in acute cases whilst in subacute or chronic cases it is a beneficial measure and in some instances of herniæ *en glissade* it is a recognized method of surgical treatment. In strangulated herniæ it has been recognized for a long time. In non strangulated herniæ its occurrence has been overlooked and we have urged that illustrations of it will be found most frequently in connection with adherent omentum large bowel and bladder. In contrast with this the acute forms almost invariably contain small bowel.

#### DIAGNOSIS PROGNOSIS AND TREATMENT

The danger of reduction *en masse* lies in its not being recognized and its necessitating a further operation. From the 137 cases examined we know that the surgeon or other medical man was responsible for its occurrence in 50 per cent of the cases. As it occurs through taxis its occurrence is a warning against the injudicious use of taxis particularly in small herniæ of recent formation and large herniæ of old standing. We know from the examination of the recorded experiences of others that it is in these two classes of case that the accident most frequently occurs. Further we know that the patient's own taxis can cause it but whilst we can influence the doctor we cannot control the patient. And yet again we know that it can occur spontaneously and would suggest that an important factor in the production of this is the vigorous peristalsis of the bowel above the obstruction such as in a case of partial enterocele or Richter's hernia or in any other case where a small knuckle of gut is strangulated. Thus we would suggest that spontaneous reduction *en masse* is most likely to occur in



cases of strangulated femoral, small and recent inguinal and obturator herniæ. Further, we would like to urge the practical difficulty of making a herniotomy or kelotomy in some cases, such as with a small partial enterocele, and the possibility of such cases being reduced *en masse* even at the operation. Several such cases have been recorded in the literature, and in this communication we have reported another because it is not generally appreciated that the accident can happen at an operation! And further, we should add that it is only likely to happen after an operation on a femoral hernia.

The diagnosis of reduction *en masse* can be summed up in the words "the continuance of the signs and symptoms of intestinal obstruction after the apparent reduction of the hernia" by taxis or operation. Such a clinical course is only likely to be the result of intestinal obstruction or peritonitis. And it is often impossible to say which. Still, the treatment is easier to decide than the diagnosis. If the signs and symptoms of obstruction persist after the reduction of a hernia, the abdomen should be opened and the reason why ascertained and treated. This should be done with as little delay as is necessary to make the diagnosis of the persistence of the symptoms.

But all cases are not so easy as the above might lead one to imagine. The reduction *en masse* of a partial enterocele, most likely from a femoral or obturator hernia, may be followed by some relief of the symptoms, the bowels acting and the vomiting ceasing. But in spite of this temporary relief there is no real and lasting improvement. It is sufficient to delay the diagnosis of "unrelieved obstruction" being made before the ensnared bowel is necrosed or beyond recovery, and perhaps the patient may have become too ill to bear and recover from an operation which may be a long one, for it is worse than useless to curtail any steps such as the cleansing of the peritoneal cavity.

An important physical sign in some cases is that the upper part of the inguinal canal on the side of the hernia is indefinitely "full" and not empty.

The proper surgical treatment of these cases is to operate

either by making an incision in the middle line of the abdomen below the umbilicus when the exact diagnosis is uncertain or if the cause of the illness can be ascertained an incision can be made over the region where the hernia was reduced *en masse* and especially so if the inguinal canal feels full. These abdominal incisions can be termed general and local respectively. In the majority of cases the diagnosis is not clear and a general incision is made. A local incision is often adequate for an inguinal hernia but not for a femoral in which instances the general incision is to be preferred.

If an operation has already been performed and the symptoms of obstruction persist the general incision is the best.

# DIAGNOSIS OF RENAL DISEASE AND SUFFICIENCY.

BY BENJAMIN A THOMAS, M D,

OF PHILADELPHIA,

Assistant Instructor in Surgery in the University of Pennsylvania, Assistant Surgeon in the Out-Patient Department of the University Hospital

MODERN surgery furnishes no more striking evidence of the keen desire for increased accuracy and advancement in diagnosis and prognosis than that to be found in the laborious and persistent efforts which have been made in order to place before the profession thoroughly trustworthy methods for the estimation of renal disease and sufficiency

Until recent years, surgeons have been content in their examination of the kidneys of patients to note the mobility, sensibility, and size of the organs, and to rely upon this, together with a more or less careful analysis of the urine, for the diagnosis of renal disease or an estimation of the renal function. Such information as may be based upon these factors alone must be somewhat variable, and in many instances positively unreliable.

It is my object within the limited scope of this article, to direct attention to the value of the routine employment of the cystoscope supplemented when indicated by ureteral catheterization for purposes of diagnosis in the symptomatology of genito-urinary diseases. Naturally, it is not only superfluous but impossible to enter into a detailed description, in a paper of this length, of the asepsis and technique demanded by cystoscopy.

It is extremely interesting to note the progress made by the indefatigable efforts to perfect renal diagnosis. The earliest attempts to catheterize the ureters were made by Axel Iversen,<sup>1</sup> Guyon,<sup>2</sup> Albarran,<sup>3</sup> and Harrison,<sup>4</sup> resorting to

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\* Read by invitation before the Philadelphia Academy of Surgery, Jan 6, 1908

operative procedures of the nature of laparotomy and perineal section Emmet<sup>5</sup> and Bozeman<sup>6</sup> accomplished the same end by colpocystotomy. About the same time it was recommended (Hegar<sup>7</sup> Sanger<sup>8</sup> Warkalla,<sup>9</sup> Czerny<sup>10</sup>) to place a temporary ligature around one of the ureters from the vaginal route while in the male sex the diseased kidney was exposed and a renal pelvic fistula established. These practices were soon condemned because too radical and serious and led to the introduction of the clamp and compression methods of Tuchmann<sup>11</sup> and his contemporaries. Noteworthy advances were made by Fenwick<sup>1</sup> and Kelly<sup>12</sup> in the employment of suction air distention and direct inspection. Of the segregators or separators the Lays<sup>14</sup> instrument deserves first choice and has proven itself of great value where ureteral catheterization was impossible unfortunately in the presence of certain vesical conditions as a medianly located ulcer or area of suppuration any separator is manifestly useless. Although to Simon<sup>15</sup> and Pawlick<sup>16</sup> is due the honor of priority in catheterizing without intravesical illumination the ureters per urethram in women it remained for Nitze<sup>17</sup> in the year 1879 to place cystoscopy in the true sense of the word upon a practical basis. Since that time rapid strides have been made in this special method of technical examination until now in many of the foremost hospitals and urological clinics of the world it has become a routine procedure. The diagnostic advantages attending the routine use of the cystoscope are so evident so numerous and so important that further emphasis of the merits of this most important aid in the diagnosis of urinary disorders would seem almost unnecessary.

The cystoscopes commonly employed are the direct vision cystoscope using air distention and the direct and indirect lens cystoscopes using a transparent fluid medium. Of these methods the first has been almost entirely discarded because of the greater liability to burns increased pain on account of heat small size of visual field inability to measure constantly the amount of inflation greater danger of infection and limitation of usefulness to the female bladder. In the lens instru-

ments direct and indirect, using always a known definite amount of sterile solution, the degree of distention of the bladder is constant and the anatomical landmarks of the interior are invariable, the visual fields are large, clear, and distinct, there is less pain and burns are unknown. Unfortunately for the direct method the entire bladder cannot be explored, an act readily performed using the indirect illumination. Naturally, any operator will have the greatest success with that form of instrument with which he has had the greatest experience. The extensive use of the indirect lens cystoscope over other forms speaks more than words for the superiority of this instrument.

Many surgeons are inclined to regard the cystoscope as an electrical toy, possessing no distinct advantage. The routine use of this instrument in difficult renal and vesical differential diagnoses cannot be too strongly urged, and indeed in many genito-urinary clinics, cystoscopy is routinely employed. By adopting such a practice, frequently with the simple cystoscope it will be possible not only to make the differential diagnosis between diseases of the bladder and kidneys, but also by noting the conditions and certain abnormalities in and about the ureteral orifices, decide which kidney is diseased, rendering ureteral catheterization unnecessary. Illustrative of this statement, allow me to cite two cases, in the service of Dr Chas H Frazier, to whom I am indebted for the privilege of these reports.

CASE I—A L, female, aged 30, was admitted to the University Hospital, May 29, 1907, complaining of a growth in her right abdomen. The social, family and previous medical histories are entirely negative, patient being throughout her life always strong and well. Five months prior to admission she noticed some discomfort when lying on her right side, and consulted a physician who informed her that she had a "tumor." On admission patient felt well, slept well and had a good appetite, but stated that she had lost weight slightly. On the right side in the region of the kidney a large, very freely movable mass was palpable. It was not painful upon pressure and motion, not connected with



TABLE No I --RECENT DISLOCATION WITH FRACTURE AT SURGICAL NECK

Operator and date of report	Number	Date of operation	Sex	Age	Dislocation	Treatment	Time	Hook	Effect of hook	Drainage	Result of effort to reduce by manipulation			Result	Result classed as
											Success	Failure	Suppuration		
Bull, W T 1897	1	4-12 96	M	15	S G	Arthrotomy tried but failed Head pried into place with periosteal elevator This case was one of epiphy seal separation Im mobilized	48 hrs	Yes	Failed	2 gauze drains into joint	1	1	1	Moderate stiffness Rotation half normal Abduction 2 horizontal Movements of scapula complete a range of motion but a trifle short of that possible on the sound side 8 mos	Fair
Brown, Geo S 1897	2		M	55	S C	Arthrotomy Head wrenched back into place Fragments came together so well it was not necessary to wire Hook was used but pulled out	48 hrs	Yes	Failed	Silk worm gut strands			1 2 mo	As good condition, apparently, as before injury	Good
Lyman, C B 1900	4 3	6 7 97	M	42	S C	Arthrotomy Slight pull with forceps on lower end of upper fragment, at right angles to body caused reduction Wired fracture	7 days			?	1			Complete recovery with good use of arm	Good
	4		M	35	?	Traction with forceps as above together with slight rotation and extension, caused reduction Wired fracture	Immediate	No		?	1	1		Complete recovery with good use of arm Results in both cases as good as seen in simple uncomplicated dislocations	Good

Curtis, B F 1900	6	5	12-4-95	M	14	S	C	Arthrotony Bone too soft and hook pulled out Head replaced by fingers and blunt instruments Head was in inward rota- tion, so shaft was ro- tated inward and wired 1 inch re- sected from lower fragment	Hook	4 weeks	Yes	Failed				13 mos 45° without moving scapula Constantly gaining Inward ro- tation greater than normal Outward ro- tation is limited Later improving	Good.	
Dandridge, N P 1900	7	6	10-11-07	M	?	S	C	Arthrotony Hook ap- plied Slipped out Again used and complete reduction seemed to have oc- curred Immobilized	Hook	18 days	Yes	Success	Tube			1	11 mo X-ray shows no change in posi- tion of head Either dislocation had re- curred or had not been reduced Anky- losis	Bad
Morton, T S K 1896	8	7		M	74	?		Arthrotony Hook used Pulled out Again used Raised head to edge of gle- noid Again pulled out Finger pressure completed reduc- tion Wired frac- ture	Hook	Imme- diate	Yes	Success	Tube		1	Sat up 8th day Died suddenly Wound clean	Died	
Williams, H J 1896	9	8	12-95	M	48	?		Chloroform Reduc- tion of dislocation and adjustment of fracture 5 weeks Ankylosis Violent manipulation and vigorous passive motion for 7 weeks	Reduc- tion of dislocation and adjustment of fracture 5 weeks Ankylosis Violent manipulation and vigorous passive motion for 7 weeks	Imme- diate				1(?)	12 weeks Abduction 45° Forward and backward motion is nearly entirely re- covered	Bad		
Monks, G H 1896	21	9		M	50	S	G	Arthrotony Could not replace head on account of subscap- ularis tendon This was cut Head ex- cised	Could not replace head on account of subscap- ularis tendon This was cut Head ex- cised	Imme- diate				1	Death on 4th day Wound clean	Died		



TABLE No 1—RECENT DISLOCATION WITH FRACTURE AT SURGICAL NECK—Continued

Operator and date of report	Number	Date of operation	Sex	Age	Dislocation	Treatment	Time	Hook	Effect of hook	Drainage	Result of effort to reduce by manipulation			Primary union	Result	Result classed as
											Success	Failure	Fracture			
Rovalet, A 1901	26	10 11-18 00	M	46	S C	Bandage 15 days, then movements. New articulation formed	2 days				1				2½ mos Elevation to horizontal. Vertical elevation impossible. Adduction is good. Abduction easy to horizontal. Extension and flexion good. 1 year improved	Fair
Von Dölsberg 1902	11		M	39	?	Rest and massage	8 days				1				2½ mos Improved considerably. The best result	Improved
	32				?	Arthrotomy. Reduction. Wired fracture	Immediate									Good
Koehler Wm 1901	33	4-2 01	F	50	S C	Anaesthesia. Extension with 10 pound weight. Counter extension upward	Immediate								7½ mos Movements considerably restricted. Elevation 110°. Ext rotation almost lost. Int rotation good. Pain in elbow on moving arm	Fair
	34	11 20 97	M	39	S C	Rest 14 days. Unsuccessful effort at reduction. Arthrotomy. Fracture already united. Reduction by elevation and external rotation	16 days			Yes	1				7 mos Shoulder functions perfectly normal	Good

Rouette 1903	35	15 to 23-02	M	29	S C	Resection	20 days		Yes			1	1	1	Can raise arm to horizontal and carry hand to head	Improved
Royster, H A 1907	39	16 11-25-05	M	60	S C	Arthrotomy Head replaced without slightest difficulty No wiring necessary	4 hours		None					1	Perfect Has as good use of shoulder as he ever had	Good
Berger 1898	41	17 6-22-98	M	32	Backward	Reduced under chloro form	3 days					1		2	2 mos Mobility satisfactory Edema to elbow Marked atrophy of deltoid	Improved
Stemen, C B 1893	45	18 1870	M	30	?	Arthrotomy Reduction by grasping bone with lion-jawed forceps Treated as a compound fracture	10 hrs	No	Yes			1		1	Good	Good
	49	19 ?	?	?	?	Similar case similarly treated only in this case which was a few years ago, we used antiseptic precaution and wound healed by first intention	Recent							1	Good	Good
Porter, C B 1894	42	20 11-18-93	M	54	S C	Arthrotomy Reduction with hook Loose fragments of bone removed	9 days	Yes	Success			1		6	6 mos As good as before operation	Good
1897	43	21 1896	F	50	?	Arthrotomy Hook unsuccessful Biceps tendon divided and the head finally replaced Wired bone Prolonged suppuration finally required resection	1 mo	Yes	Failed			1	1	1	1 year Fistulous tracts persist Can reach head with hand	Improved
Brinton, J H 1897	49	22	F	?	Backward	Excision	3 days		Yes			1		2	2 mos Motions of false joint returning satisfactorily	Improved

TABLE NO I—RECENT DISLOCATION WITH FRACTURE AT SURGICAL NECK—Continued

Operator and date of report	Number	Date of operation	Sex	Age	Dislocation	Treatment	Time	Hook	Effect of hook	Drainage	Result of effort to reduce by manipulation			Result	Result classed as
											Success	Failure	Fracture		
Berger 1896	40	23	?	?	S C	Arthrotomy and levers failed Replaced by seizing tuberosities with for ceps and applying force Immobilized fracture	10 days	Yes	Failed	Yes	+			3 mos Carries hand to head Can raise elbow to level of shoulder	Improved
Lane, Arbuthnot 1903	51	24	M	60	S C	Wired fracture Does not mention treatment of dislocation	Probably Recent							' Unconvntual prog-ress "	Not stated
Wohlgemuth, Heinz 1900	19	25	M	40	S C	X-ray Surgical neck greater tuberosity and whole crista tuberculi majoris fractured Anesthetized Dislocation reduced Fracture immobilized					+			Greater tuberosity has united further posteriorly on shaft Ext rotation almost entirely prevented Elevation markedly impaired Abduction 60°	Improved
Clutton H H 1894	53	26	M	13	S C	Shock caused death 11 days Arthrotomy Head replaced by direct pressure and traction Drill passed vertically downward from head into lower fragment Ivory peg inserted Biceps tendon had to be cut and was sutured	11 days	No						8 mos All movements of shoulder-joint arc performed perfectly Keloid in scar	Good

Wyeth, J A 1895	55	27-10-22-95	F	45	?	Arthrotomy inserted in 3 differ- ent places. Failed to reduce. Adhesions made. Reduction im- possible. Extension	Hook 2 weeks (?)	Yes	Failed	1	Death in 21 hours	Died
Mason, J M 1907	28	11-11-06	M	35	S C	Efforts to reduce failed. Arthrotomy. Head pried into its place with periosteal ele- vator. Fracture wired	6 hours	No		1	1 year Perfect re- sult. No limitation of motion in any di- rection. No atro- phy. No pain. No loss of strength	Good

TABLE No II—OLD DISLOCATION WITH FRACTURE AT SURGICAL NECK

Operator and date of report	Number	Date of operation	Sex	Age	Dislocation	Treatment	Time	Hook	Effect of hook	Drainage	Result of effort to reduce by manipulation			Result	Result classed as
											Success	Failure	Suppuration		
Lyman, C B 1900	4	1	F	42	S C	Head displaced for one year and fibrous union of fracture had occurred Resected and wired fracture Intended to treat dislocation later Patient did not return	1 year					1		3 years of fracture union Quite free motion in new position beneath the coracoid	Fair
Porter, C B 1903	20	2 10 11-02	M	?	S C	Arthrotoomy Removal of head	1 mo					1		11 mo Great improvement Lifts right arm to horizontal Fast gaining use of left	Improved
Dollinger J 1902	31	3 10 18 02	M	?	S C	Arthrotoomy Removal of head	6 weeks					1		1 A ease of double fracture dislocation	Improved
			?	?	?	Resected head and upper fragment which had united at right angles	Old					1		No notes	No notes
Abrahamoff, A 1896	5 10 14 95 36	62	M	62	S C	Unsuccessful attempts to reduce by manipulation under other Resected head	7 weeks					1		3 1/2 mos Raises arm 45° Abduction and adduction free Circumduction limited No pain Can lift heavy weights	Improved

Royster, H A 1907	39	6	I	52	?	Physiarm failed in efforts to reduce. Decided to wait for union, then to attempt reduction. Royster in attempting reduction by Koehler's method re-fractured. Arthrotomy. Could not replace head. Tried to produce false joint but fracture reunited.	9 weeks				Effect of operation was	Bad	
Linon 1898	51	7	M	45	S G	X-ray Head united to outer portion of humerus. Surgical interference not considered. Massage and electricity to try to improve extensive paralysis.	60 days				3 mos	Deltoid pretty improved. Raises arm to horizontal. Can close hand $\frac{1}{2}$ .	Bad
Ricketts, B M 1894	54	8	M	49	S C	Failure to reduce under anesthesia. Rest 6 weeks. Arthrotomy. Anatomical and surgical necks broken and united. Nothing further attempted. Wound closed.	6 weeks				No notes on functional result. The general health is improved. Asks "Should head have been resected at time of attempted arthrotomy?"	Bad	
Royster, H A 1907	39	9	?	45	S C	Comminuted fracture upper extremity of humerus. 6 separate fragments. Line of fracture through surgical neck and 4 inches down shaft. Removed loose bone and packed cavity to form false joint.	6½ weeks	Yes			2 years	Can use arm for all ordinary purposes and with assistance of the other hand can put it in any position except wide adduction.	Improved

Yes

TABLE No III—RECENT DISLOCATION WITH FRACTURE AT ANATOMICAL NECK

Operator and date of report	Number	Date of operation	Sex	Age	Dislocation	Treatment	Time	Hook	Effect of hook	Drainage	Result of effort to reduce by manipulation			Result	Result classed as
											Success	Failure	Suppuration		
Curtis, B F 1900	6	3 28-99	M	29	S C	Arthrotomy Head entirely outside capsule. Feared necrosis if replaced and newly formed vascular connections disturbed. Head and large part greater tuberosity removed	21 days						Primary union	16 mos Abduction 41° normal Int rotation nearly normal Ext rotation much limited Does heavy work and arm is gaining strength Some atrophy	Fair
	2	9 6 99	F	11	S G	Arthrotomy Anterior incision Head could not be reached Kocher's posterior incision Acromion divided Extension with pressure on head in front and behind caused reduction Bone drill driven deep into head through anterior aspect of shoulder Left in place 20 days Acromion wired	24 hrs	No		None		1		17 50th day Abduction 60°, adduction complete Int rotation almost normal Ext rotation much limited Anteroposterior movements free No atrophy This arm was crooked and partially paralyzed from birth	Fair
Gerster A G 1898	9	3 10 15-97	M	47	S G	Removal of head wired	4 weeks			Tubes			1	Death on 5th day Reacted poorly from operation and the wound suppurated	Died

McBurney, Chas 10 1896	4 11-10-95	M	28	S C	Arthrotomy Hook After 3rd pull head was replaced with assistance of pres- sure on head. Sur- faces met accurately. Sutured with cat gut	1 mo	Yes	Successful	Tube 4 days	1 1 *	1 6 weeks Strength in all positions turned fully except when arm is at right angles or higher	Good
Taylor, William 14 1901	5	M	60	S C	Head displaced down- ward and inward. Also rotated. Frac- ture through ana- tomical neck. Also through great tuber- osity and 2 small pieces near lesser tu- berosity. Excision	2 days					Lower motions of arm perfect. Limitation in upward motions. Has returned to work	Fair
Jepson, W 1900	6 9-30-99	M	48	S C	Head of bone removed	Imme- diate (?)				1	Motion of shoulder is good and function of arm seemingly not materially disturb- ed	Fair
Prewett, F E 1901	7	M	27	?	Head replaced. Frac- tured surfaces placed in apposition. Three days later dressing changed as it did not retain fragments in position. Again re- duced dislocation and fracture	24 hrs			1		Perfect result	Good
Roualet, Adrien 26 1901	8	F	23	S C	Unsuccessful attempt at reduction on 2nd 9th and 20th days. Further treatment by rest and massage	9 days				1	6 weeks Had recov- ered motion of eleva- tion and adduction. Very limited	Bad
Clutton, H H 1892	9	F	61	S G	Excision of head and great tuberosity	8 days				1	8 mos Can put hand to mouth, back of head, opposite shoul- der, behind back. Shoulder rather fixed in raising arm from side	Improved

\* Refracture



TABLE No III—RECENT DISLOCATION WITH FRACTURE AT ANATOMICAL NECK—Continued

Operator and date of report	Number	Date of operation	Sex	Age	Dislocation	Treatment	Time	Hook	Effect of hook	Drainage	Result of effort to reduce by manipulation			Result	Result classed as
											Success	Failure	Fracture		
McGraw, Th 1897	48 10		M	45	S G	Fracture through anatomical neck and completely detached in axilla. Second fracture passing from above and in front, downward backward, and outward below tuberosities. Excised	4 weeks					x	13 mos Can lift arm nearly at right angles with body	Improved	
Delorme 1899	24 11		?	?	?	Freed head and re placed	28 days						Movements nearly all Fair established	Fair	
Dunham, M V 1895	B 12 56	1887	M	65	?	Rest and fixation for 7 weeks Passive motion	12 hrs					x	Several months Does light work not requiring an extensive range of motion Places hand on head Feeds and dresses himself	Improved	
Reidel 1900	38 13 11 23 99		M	60	S C	Reposition effected by 2 pulls on adducted arm Exact line of fracture not stated	Few days					x	No notes	No notes	

TABLE No IV—OLD DISLOCATION WITH FRACTURE AT ANATOMICAL NECK

Operator and date of report	Number	Date of operation	Sex	Age	Dislocation	Treatment	Time	Hook	Effect of hook	Drainage	Result of effort to reduce by manipulation			Result	Result classed as
											Success	Failure	Fracture		
Brigham, C B 1900	3	12-12-99	M	34	S G	Excision of head	5 mos			Tube	1	1	1	1	Improved
Pilcher, L S 1901	5	1900	?	?	S C	Fracture already consolidated, but head was rotated and displaced Excised head	6 weeks							3 mos and 3 weeks	Fair
Keen, W W 1907	67	12-27-05	M	60	S C	Arthrotomy Upper end of humerus was almost entirely smooth Hopeless to obtain union Head completely rotated Removed	5½ weeks			Yes	1* (?)			13 mos Raised arm is normal Atrophy is disappearing Uses arm well in digging etc	Improved
Maxwell, J P 1902	15		M	29	S C	Chloroform on 2 occasions Failure to reduce Excision of head	5½ weeks			Yes	1			1 year Rotation fair Elevation almost vertical Passes the hand behind back	Fair
Robert 1899	23	7-18 99	M	?	S G	Head disengaged from fibrous tissue adhesions etc Replaced by Farabeuf's forceps Fracture already united	55 days				1			No notes	No notes

TABLE NO IV —OLD DISLOCATION WITH FRACTURE AT ANATOMICAL NECK—Continued

Operator and date of report	Number	Date of operation	Sex	Age	Dislocation	Treatment	Time	Hook	Effect of hook,	Drainage	Result of effort to reduce by manipulation			Result	Result classed as
											Success	Failure	Fracture		
Tansini, I 1897	25	6 2 11 97	M	?	S G	Difficult excision	3 mos					1	1	28th day 'Able to use left joint'	Improved
Bousquet 1895	27		F	68	S G	Head incased in fibrous celi. Was excised by Villar	1 mo				1*			No notes	No notes
Dollinger, J 1902	31		?	?	?	Performed Linear Arthrotomy (?)	Old							No notes	No notes
Royster, H A 1907	39	6-19-07	M	20	S C	Arthrotomy Healed fracture through anatomical neck Head replaced with fingers and forceps	2 mos			Small	1*			1 1 mo most years perfect 2 years Entirely perfect	Good
Riedel 1899	57 10 11 12 13					Reports operating on 2 cases with total destruction of head and 2 cases in which head had reunited laterally to shaft No details	Old Old Old Old							Not reported in such a manner that results can be classified	No notes

\* Recurred

TABLE No V—DISLOCATION WITH FRACTURE OF GREATER TUBEROSITY OF HUMERUS

Operator and date of report	Number	Date of operation	Sex	Age	Dislocation	Treatment	Time	Hook	Effect of hook	Drainage	Result of effort to reduce by manipulation			Result	Result classed as
											Success	Failure	Fracture		
Keen, W W 1907	11	2-2-07	M	59	S G	Immediate reduction of dislocation 7th day. Gr tuberosity exposed, drawn into position and nailed down 2 wire nails used. Protruded through skin. 1 removed in 2 weeks, 1 in 3 weeks. Arthroscopy. A bony material found in glenoid cavity. Removed and found to consist of greater tuberosity. Reduction then easily effected.	7 days			Yes				1 mo and 2 days passive motion just beginning. But little ankylosis	Fair
Vaughan, Geo T 1903	12	3-21-03	M	60	S C	Unsuccessful efforts to reduce under anesthetic on 3 occasions. No further notes on treatment.	2 mos			No	1	1		1 Great relief from pain. No notes on function.	Improved
Turner, G I 1902	3		M	38	?	Chloroform at end of 2 1/2 weeks. All attempts to reduce failed. Marked crepitus at outer surface of caput humeri while being rotated. No X-ray. No further treatment permitted.	32 days							No notes	Not stated
	4		M	60	?		2 1/2 weeks							No notes	Not stated

TABLE No V.—DISLOCATION WITH FRACTURE OF GREATER TUBEROSITY OF HUMERUS—Continued

Operator and date of report	Number	Date of operation	Sex	Age	Dislocation	Treatment	Time	Hook	Effect of hook	Drainage	Result of effort to reduce by manipulation				Result	Result classed as
											Success	Failure	Fracture	Suppuration		
Wohlgemuth, H 1900	5		M	60	S C	Immediate reduction. Function did not return 2 years later. X-ray showed dislocation reduced but greater tuberosity located farther upward and outward than normal. Tuberosity touched acromion before arm was raised to level of shoulder. Impairment of movement resulted.	2 years				1				No notes	Not stated
Bachr F 1898	6	22	F	23	S G	Unrecognized for 1 month, then reduced (?) Came into hands of B 3 1/2 months. X ray showed dislocation and fracture of greater tuberosity. No attempts at reduction.	3 1/2 mos				1 (?)				11 mos All movements except bringing arm over back. This was possible but difficult.	Improved
Dollinger, J 1902	7	31	?	?	?	Arthrotomy. Tuberosity removed. Dislocation reduced.	?				1				No notes	Not stated

Reclus 1904	28	8		?	?	S C	Unsuccessful attempts to reduce for 3 days 8th day Heitz-Boyer apparatus caused gradual descent of head. On 4th day gentle manipulation replaced head. Fracture reduced at same time.	Immediate efforts to reduce failed. X-ray showed dislocation and fracture greater tuberosity. On 18th day, attempts to reduce again failed. 28th day Arthrotomy. Difficult reposition.	Arthrotomy. Reduction by leverage with lithotomy scoop. Removed the tuberosity.	Incision on outer aspect of shaft. Hook inserted. Second hook in base of spine of scapula. Capsule freed with knife and elevator. Reduced. Fracture of greater tuberosity with formation of new bone. Thus struck edge of glenoid and prevented reduction.	Arthrotomy. Gt tuberosity fractured, displaced downward and united laterally to shaft. Head replaced. Gt tuberosity chiselled off. Wound left unsutured.	11 days	Yes					X-ray shows no discrepancies in two humeri. No notes on function.	Improved
Thomsen, H L 1904	37	9	4-3-03	M	52	S C	Immediate efforts to reduce failed. X-ray showed dislocation and fracture greater tuberosity. On 18th day, attempts to reduce again failed. 28th day Arthrotomy. Difficult reposition.	Arthrotomy. Reduction by leverage with lithotomy scoop. Removed the tuberosity.	Incision on outer aspect of shaft. Hook inserted. Second hook in base of spine of scapula. Capsule freed with knife and elevator. Reduced. Fracture of greater tuberosity with formation of new bone. Thus struck edge of glenoid and prevented reduction.	Arthrotomy. Gt tuberosity fractured, displaced downward and united laterally to shaft. Head replaced. Gt tuberosity chiselled off. Wound left unsutured.	11 days	Yes						Suppuration for 6 weeks. Complete ankylosis 8 months. Abduction 30°. Rotation 15°. Deltoid atrophic.	Improved
Watson 1889	46	10		M	40	S C	Arthrotomy. Reduction by leverage with lithotomy scoop. Removed the tuberosity.	Incision on outer aspect of shaft. Hook inserted. Second hook in base of spine of scapula. Capsule freed with knife and elevator. Reduced. Fracture of greater tuberosity with formation of new bone. Thus struck edge of glenoid and prevented reduction.	Arthrotomy. Gt tuberosity fractured, displaced downward and united laterally to shaft. Head replaced. Gt tuberosity chiselled off. Wound left unsutured.	11 days	Yes						8 mos. Very good. Some impairment.	Improved	
McBurney, 1895	52	11	10 25-94	M	?	S C	Arthrotomy. Reduction by leverage with lithotomy scoop. Removed the tuberosity.	Incision on outer aspect of shaft. Hook inserted. Second hook in base of spine of scapula. Capsule freed with knife and elevator. Reduced. Fracture of greater tuberosity with formation of new bone. Thus struck edge of glenoid and prevented reduction.	Arthrotomy. Gt tuberosity fractured, displaced downward and united laterally to shaft. Head replaced. Gt tuberosity chiselled off. Wound left unsutured.	11 days	Yes						6 weeks. Gradually considerable motion obtained. No doubt but that arm will become very useful.	Improved	
Reidel 1899	57	12	1-8-99	M	51	?	Arthrotomy. Gt tuberosity fractured, displaced downward and united laterally to shaft. Head replaced. Gt tuberosity chiselled off. Wound left unsutured.	Arthrotomy. Gt tuberosity fractured, displaced downward and united laterally to shaft. Head replaced. Gt tuberosity chiselled off. Wound left unsutured.	Arthrotomy. Gt tuberosity fractured, displaced downward and united laterally to shaft. Head replaced. Gt tuberosity chiselled off. Wound left unsutured.	11 days	Yes						10 years. Arm strong. Motion in joint without crepitus forward and backward 30-40 degrees. Outward 10 degrees. Rotation minimal.	Improved	



I have collected since his report, 63 cases, including my own, which gives a total of 180 reported cases

In my series the fractures have been classed as follows  
Of the surgical neck 37 cases, of the anatomical neck 26 cases

The dislocations are Subcoracoid 31, subspinous 2, subglenoid 11, not stated 19

Efforts to reduce by manipulation were successful in 7 cases, of which 3 recurred and 1 was of doubtful success Failure is recorded in 37 cases, and in 19 cases it is not stated that attempts were made to reduce, but it is quite likely that in every case some effort was made to reduce before resorting to operation

Fracture or refracture occurred in attempting reduction in 7 instances

Taking one month as the arbitrary dividing line between recent and old cases, four tables have been prepared recent dislocation with fracture at the surgical neck, 29 cases, old dislocation with fracture at the surgical neck, 9 cases, recent dislocation with fracture at the anatomical neck, 13 cases, old dislocation with fracture at the anatomical neck, 13 cases

A table is also appended containing 21 cases of dislocation with fracture of the greater tuberosity

Where the fracture has not been confined to one or the other neck, or where the line of fracture has not been clearly stated, the case has been classed under one of the above heads as accurately as possible, taking all the circumstances into consideration

In classifying results, I have adopted the plan of Curtis, who says "In order to obtain an idea of the relative merits of reduction and resection, we must first remember that even the best functional result after resection is not to be compared to the nearly perfect shoulder-joint which can sometimes be obtained by returning the normal head to its natural articulating cavity The result of a reduction may fall considerably below this perfection and still be as good as the best obtainable after resection We shall therefore classify the results of reduction as good, fair, and bad, and the results of resection as fair, improved and bad " 6



## SUMMARY

TABLE I—RECENT DISLOCATION WITH FRACTURE AT SURGICAL NECK  
(Number of Cases 29)

TREATMENT	No	RESULT					
		Good	Fair	Impr	Bad	Died	Not Stated
Arthrotomy and Reduction	18	12	1	1	2	2	
Reduction	4		1	2	1		
Rest and Massage	2		1	1			
Excision	4		3			1	
Not stated	1						1
Total	29	12	6	4	3	3	1

One case is counted twice, Primary Arthrotomy with Reduction, and Secondary Excision

TABLE II—OLD DISLOCATION WITH FRACTURE AT SURGICAL NECK  
(Number of Cases 9)

TREATMENT	No	RESULT					
		Good	Fair	Impr	Bad	Died	Not Stated
Excision	5		1	3			1
Dislocation Untreated	2		1		1		
Massage and Electricity	1				1		
Ribera	1				1		
Total	9		2	3	3		1

TABLE III—RECENT DISLOCATION WITH FRACTURE AT ANATOMICAL NECK  
(Number of Cases 13)

TREATMENT	No	RESULT					
		Good	Fair	Impr	Bad	Died	Not Stated
Excision	6		3	2		1	
Arthrotomy and Reduction	3	1	2				
Reduction	2	1					1
Rest and Massage	2			1	1		
Total	13	2	5	3	1	1	1

TABLE IV—OLD DISLOCATION WITH FRACTURE AT ANATOMICAL NECK  
(Number of Cases 13)

TREATMENT	No	RESULT					
		Good	Fair	Impr	Bad	Died	Not Stated
Excision	6		2	3			1
Arthrotomy and Reduction	2	1					1
Linear Arthrotomy (?) Ribera	1						1
Not clearly stated	4						4
Total	13	1	2	3			7

## CONDENSED SUMMARY OF ALL CASES

(Number of Cases 63)

TREATMENT	No	RESULT					
		Good	Fair	Impr	Bad	Died	Not Stated
Arthrotomy Reduction	23	14	3	1	2	2	1
Excisions	21		9	10		2	
Reduction by Manipulation	6	1	1	2	1		1
Rest and Massage	5		1	2	2		
Dislocation not treated	2		1		1		
Riberi Method	2				1		1
Not stated	5						5
Total	64	15	15	15	7	4	8

(See note at foot of Table I, one case counted twice)

From the condensed tables we find 23 cases of arthrotomy with reduction, and 14 good results, 60.8 per cent, against 21 resections with 9 fair results, 42.8 per cent. The cases classed as "good" include those where there is practically no impairment of function, and in several instances it is distinctly stated that there was perfect restoration.

Those cases of resection classed as "fair" include the best results to be obtained after resection. If no distinction were made and they were all classed as "good," there would still be a large difference in favor of arthrotomy and reduction. The results in Table No. I, early arthrotomy in dislocation with fracture at the surgical neck, show 18 operations with 12 good results, and to this should be added McBurney's first case, which is not included in this series, making 19 cases with 13 good results, 68.5 per cent. If we combine the results in Tables I and III and add McBurney's case, we have 22 recent cases of arthrotomy and reduction with 14 good results, 64 per cent. Let it be borne in mind that the tables of recent cases include everything within the first month after injury, and it will be apparent that a much higher percentage of perfect recoveries would follow immediate operation in all cases which manipulation failed to reduce.

The problem of dealing with dislocation with fracture at the anatomical neck differs in some respects from that

encountered when the fracture is at the surgical neck. In either event, delay in reducing the dislocation will make that part of the treatment more difficult. Union of fracture at the anatomical neck is much more apt to fail than when the fracture is at the surgical neck. When the fracture is at the anatomical neck and the head is entirely separated, it is cut off from all its blood supply, and while theoretically one would expect it to undergo necrosis if not at once restored, still Gray says that this must be an exceedingly rare occurrence, and Gurlt was unable to find a single authenticated case on record.<sup>59</sup> However, if the head remains detached from the shaft long enough for the ends of the bone to become smoothed over, as was the case with Keen's patient, the upper fragment is too small to permit of freshening as might be done with a fracture at the surgical neck, and excision will have to be practiced. For this particular reason, I do not agree with the statement of Curtis that a delay of from one to four weeks will not impair the result.<sup>6</sup>

If any infection is introduced in performing arthrotomy, the separated head, on account of its poor blood supply, will almost certainly undergo suppuration and necrosis, requiring secondary excision. After reduction, the head should be attached to the humerus by suture or nails.

Dislocation complicated by fracture of the greater tuberosity was considered very unusual until the X-ray came into general use, and fracture of the greater tuberosity alone was thought to be even more rare. Keen was able to present to the Philadelphia Academy of Surgery in March, 1907, 23 skiagraphs of this fracture alone or associated with other injuries. These he collected from the different hospitals of Philadelphia, and at the same meeting reported a case of dislocation with fracture of the tuberosity in which he nailed the tuberosity in place after reducing the dislocation. In going over the literature of dislocation of the shoulder with fracture of the neck of the humerus, I have collected 21 cases of dislocation with fracture of the greater tuberosity. No attempt has been made to make this collection exhaustive, and only

those cases have been recorded which have come under my notice while studying the other subject. The fractured tuberosity is often an obstacle to the reduction of what may appear to be a simple dislocation. With only the tuberosity fractured, the humeral shaft is still available as a lever in reducing the shoulder dislocation, but the tuberosity frequently becomes detached and is displaced between the head of the humerus and some of the overhanging processes of the scapula, acting as an obstacle to the return of the head of the humerus to the glenoid cavity. If left untreated and displaced, even if the dislocation is reduced, the fragment will either attach itself to the humerus in some abnormal position, thereby impairing some of the motions of the joint, or may be drawn into the capsule and become attached somewhere inside the joint cavity to interfere with the free movements of the shoulder.

The histories of the 21 cases in my series show the following treatment and results

TREATMENT	TREATMENT OF DISLOCATION					
	No	RESULT				
		Good	Fair	Impr	Bad	Died Not Stated
Reduction	2			1		1
Arthrotomy and Reduction	9		1	5	3	
Left unreduced	3					3
Reduced by Heitz-Boyer Apparatus	1					1
Not clearly stated	6					1 5
Total	21		1	6	3	1 10

TREATMENT OF FRACTURED TUBEROSITY	
Nailed in position	1
Removed	7
Untreated	4
Replaced by using Heitz-Boyer apparatus	1
Not stated	8
Total	21

Reidel states that he has operated on 15 old irreducible dislocations of the shoulder, and found 14 of them associated

with fracture and only one case uncomplicated Of the 14 cases, 10 showed fracture of the greater tuberosity

We see, therefore, that dislocation is often rendered irreducible by the presence of a fractured tuberosity, and that, with dislocation reduced and the fracture untreated, there is often impairment of the function of the joint The great value of the X-ray in clearing up all injuries of the joint cannot be too strongly urged, and we should employ the rays in every case

In early cases the dislocation should be reduced by manipulation, if this can be accomplished with gentleness, and the tuberosity should be treated by nailing into position as Keen recommends

If this treatment should prove unsuccessful, the dislocation should be treated by arthrotomy and reduction, and the tuberosity should be nailed down in its proper position It should be removed if it cannot be replaced In old cases, it will be necessary to perform arthrotomy, remove exostoses and tuberosities united in abnormal positions, and then reduce the dislocation

In those injuries where the whole upper extremity of the humerus is crushed, no general plan of treatment can be laid down, and the judgment of the operator must dictate the plan of procedure

Excision, however, gives, oftentimes, very useful arms, and is to be preferred to allowing the cases to go on to probable ankylosis with excessive callus thrown out around badly displaced fragments

### CONCLUSIONS

1 Every dislocation of the shoulder associated with fracture of the upper extremity of the humerus is a grave injury, and is likely to result in serious impairment of function if not promptly treated

2 Every such injury should be subjected to X-ray examination for accuracy in diagnosis

3 Gentleness should characterize all manipulative efforts

at reduction, and these should never be carried to the point of bruising or lacerating the tissues

4 Excision should only be practiced when reduction by open arthrotomy has failed, or where there is extensive communication of the upper extremity of the humerus, or when, in fracture at the anatomical neck, the condition of the upper fragment does not justify a reasonable expectation of uniting

5 After reduction, the broken greater tuberosity should be nailed into position if the case is recent, and should be removed if it causes impairment of function in an old case

6 Failing to reduce by manipulation, immediate arthrotomy with reduction of the dislocation, followed by appropriate treatment for the fracture, has given the best results, and is the ideal method of treatment

7 Rigid asepsis is essential in securing good results, and these operations should not be undertaken where this cannot be carried out

#### NOTE

Reidel's 14 cases are reported in such a manner that they can hardly be classified under any of my headings, so the following is abstracted from his excellent paper. He operated 15 times where reposition could not be accomplished, and found that 14 of the cases had sustained fracture at the same time. In some there was total destruction of the dislocated head, in two cases fractured head of the humerus had united laterally to the shaft, the greater tuberosity was torn off alone in 4 cases, associated with fracture of the lesser tuberosity in 6 cases. In all cases of fractured tuberosity large bony protuberances had formed owing to periosteal proliferation. He treated 7 of the 15 cases by primary resection. All terminated favorably except one, aged 70, who died from hemorrhage on 6th day. He mentions that four of nine operative repositions failed and had to be followed by secondary excision. In 5 cases operative reposition was successful, one case not complicated by fracture<sup>67</sup>

(Some of his work must have been a good many years ago, as one of the cases he reports was operated on in 1889, and he seems to have gotten a considerable amount of suppuration. Reference to his paper shows that he treated many of his cases by packing, and in some instances states that the wounds were not sutured. His open treatment was conducive to adhesions and ankylosis and it is not surprising that he had some very poor results. It must be remembered, too, that he was dealing with old cases, and more extensive operative work was necessary than in recent cases.)

## ADDENDA

Since the completion of this paper, I have found the reports of two cases of fracture-dislocation operated upon by Schlange. One was fracture of the surgical and one of the anatomical neck, each case was operated on within the first 24 hours and the results were good <sup>67</sup>

In the 5th edition of Stimson's work on fractures and dislocations, recently published, he mentions without details, two cases in which he practiced excision of the head of the humerus <sup>68</sup>

On Jan 6, 1908, it was my good fortune to see, in consultation with Drs W P McAdory and M A Copeland of this city, a case of backward dislocation of the left shoulder with fracture of the surgical neck. Dr McAdory operated on the 5th day after the injury, reducing the dislocation and wiring the broken bone. The history of the case, together with the result will be reported by him when the patient has recovered.

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# A TREATMENT OF EPIPHYSEAL DISPLACEMENTS AND FRACTURES OF THE UPPER EXTREMITY OF THE HUMERUS DESIGNED TO ASSURE DEFINITE ADJUSTMENT AND FIXATION OF THE FRAGMENTS

BY ROYAL WHITMAN, M D ,

OF NEW YORK,

Associate Surgeon to the Hospital for the Ruptured and Crippled.

IN characteristic cases of epiphyseal separation of the head of the humerus, or similar fractures in later years, one notes a sharp projection below and in front of the acromion process which represents the anterior and upper extremity of the shaft, the head being relatively below, within, and behind it

In many of the reported cases this projection has been mistaken for a dislocation and unavailing attempts have been made to reduce it, the deformity reappearing when the arm is placed by the side. Nor does a correct diagnosis lessen materially the difficulty of treatment. To quote Hamilton, "It is proper to say, that complete reduction is seldom accomplished and permanently maintained, owing probably to the advantageous action of the muscles which tend to produce the displacement, and in part also to the difficulty of applying any apparatus or dressing which shall act efficiently on the fragments."

About six years ago, a girl seven years of age was brought to the Hospital for Ruptured and Crippled who presented the typical signs of epiphyseal fracture, the injury having been received two weeks before

In this case I first employed the method of treatment similar in principle to that which I have used successfully for the corresponding injury at the hip-joint, namely, to reduce the displacement by leverage of the extremity and to appose the fragments by adjusting the attitude of the limb to conform to the separated head, or essentially in full abduc-

FIG 1



Fracture of the arm in complete abduction Photograph of the first patient treated  
in March 1902

FIG 2



The shoulder spica fixing the arm in extension abduction and elevation

tion, the alignment being aided by manipulation of the inner fragment and by tension on the capsule and the surrounding muscles

The details of the method are as follows. The patient having been anaesthetized, the adherent fragments are separated by forcible manipulation. The head is then grasped, as well as may be, by the fingers and under traction the arm is abducted gradually to the extreme limit, the acromion serving as a fulcrum to direct the extremity of the diaphysis downward toward the epiphysis. When the fragments are in apposition the abducted arm may be drawn somewhat forward, if necessary, to assure proper adjustment. One now proceeds to fix the parts in this attitude by means of what may be called a shoulder spica. This, as applied to the original case, is illustrated in Fig. 1. A better method, the one used in the second case, that of a boy twelve years of age, in which the reduction undertaken twelve days after the injury was somewhat more difficult, and now recommended, is shown in Fig. 2. The extended arm is raised over the head by rotation of the scapula so that one may better utilize muscular tension and the force of gravity to fix the fragments.

In my experience, union after epiphyseal displacement is prompt. Thus, after several weeks, the apparatus may be removed, to permit massage and appropriate exercises. In the limited number of cases that I have treated by this method, function has been perfectly restored.

If the fragments have become so adherent that they can not be separated, or if for any reason adjustment is unsatisfactory, the joint should be opened, but the advantage of the attitude and the method of fixation will then, I think, be even more apparent.

In the ordinary mode of treatment after an attempt has been made in one way or another to adjust the fragments, the arm is fixed to the body or in some indifferent attitude in which the complete or partial redisplacement is, from the nature of the injury, almost certain. The effect of this deformity is to limit abduction by contact of the upper extremity

of the humerus with the acromion and by pressure of the displaced head on the lower border of the capsule. It may be assumed also, that, aside from the impairment of function, a certain loss of growth may be expected unless the cartilage is replaced in fair relation to the diaphysis.

I have limited myself thus far to the class of cases in which I have had actual experience, but the same treatment may be utilized for fractures in this neighborhood in older subjects. It seems to me, that like the similar method which I have urged for treatment of fracture of the neck of the femur, it should appeal to those who appreciate the nature of the obstacles that make the treatment of fractures in these situations so difficult and the results so unsatisfactory.

I may mention incidentally, that what has been called the shoulder spica, is a convenient and almost indispensable means for fixing the arm after operation for lateral deformity at the elbow, or whenever one desires to hold the arm securely in the extended attitude without confining the patient to bed, the elevation preventing the œdema that is almost inevitable if the limb is pendant.

# TRAUMATIC SUBLUXATION OF THE HUMERUS

BY FRANK P VALE, M D ,

OF WASHINGTON, D C

HOWEVER frequent the deformity shown in the accompanying photograph may be in the experience of those of large opportunities, I cannot find a similar illustration in medical literature<sup>1</sup> Fifty years ago, before operative technic held the centre of the stage in surgical matters, subluxation of the humerus was a subject of considerable discussion, but under that heading there are comparatively few references exactly applicable to the case here shown—indisputably a subluxation

Sir Astley Cooper,<sup>1</sup> about one hundred years ago, in his treatise on dislocations, added subluxation of the humerus to the three varieties theretofore accepted down and inward, forward under pectoral muscle, and backward on to the dorsum of the scapula He detailed two cases of subluxation He writes "I believe this is not a very rare accident and shows itself by the following marks the head of the bone is drawn forward against the coracoid process, there is a depression opposite the back of the shoulder-joint, and the posterior one-half of the glenoid cavity is perceptible from the advance of the head of the bone, the axis of the arm is thrown inward and forward, the under motions of the limb are still capable of being performed, but its elevation is prevented by the head of the humerus striking against the coracoid process There is an evident protuberance formed by the head of the bone in its new situation, which is felt readily to roll when the arm is rotated" He permitted a discrepancy to enter into his description, however, by citing the one dissection he had seen, of this injury, in which the head of the bone was under the

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\*The exhaustive article of J William White on displacement of the long head of the biceps might be regarded as an exception to this statement (*Am J Med Sc*, 1884, p 1)



coracoid process—simply an unreduced subcoracoid dislocation, a variety not then recognized

This description of a partial dislocation of the head of the humerus precipitated a controversy which has cropped out from time to time in medical literature up to 1894. There was an academic discussion of what constituted a subluxation—this we find continued even as late as an 1891 edition of Hamilton's *Treatise on Fractures and Dislocations*

Malgaigne<sup>2</sup> marvelled that so great an anatomist as Sir Astley Cooper should make the mistake of assuming there was room for the head of the humerus between the glenoid fossa and the coracoid process. However he states that Petit, from the clinical aspects, appeared to have been disposed to admit incomplete luxation of the humerus, and that Chopart thought he had encountered one instance. Malgaigne was willing to retain the term but restricted it to subcoracoid dislocations in which the articular surface of the head of the humerus rested on the anterior glenoid border. Two such cases he had dissected, in both there was a sulcus on the head of the bone, marking the site of its contact with the glenoid border, and as in one case the autopsy was only four days after the receipt of the injury he concluded this sulcus due to the impact of the head of the bone against the glenoid border at the time of the injury. Such a sulcus then indicated a subluxation as he defined it. Sedillot<sup>3</sup> on the contrary believed that in all unreduced subcoracoid luxations the natural and final position of the head was in contact with the glenoid border, the sulcus resulting from long-continued pressure of the head in this new position.

Such subluxations, however, as defined by Malgaigne, are not of clinical interest because symptomatically indistinguishable from complete subcoracoid luxation.

In 1834 Laugier<sup>4</sup> reported a subluxation of the humerus upward and forward. The patient presented himself at the Necker Hospital with a considerable swelling of the left shoulder, the elbow could be approximated to the side of the chest, and anteroposterior movements of the arm were pos-

sible, though quite painful. Not for twelve days did this surgeon suspect it was more than a sprain, an examination at the end of that time, however, after the swelling had in a great part disappeared, revealed signs which for the first time suggested a partial displacement of the humerus. The head formed a prominence within and above, on a level with the coracoid process, behind which it was applied, between the head and the arch of the acromion there existed a depression, but little marked to the eye, yet in which could be lodged the tips of one's fingers. The axis of the arm was inclined, and slightly rotated outward on its long axis, so that the internal tuberosity of the head seemed to project in front. The most difficult movement was elevation of the arm and it was seen that this was a movement of the entire shoulder—the head resting against the coracoid process caused the scapula and clavicle to be elevated as one piece, the member was shortened 5 or 6 lines. Efforts at reduction at the end of fifteen days were without success.

Malgaigne probably allots more space to the discussion of subluxation of the humerus than any other systematic writer. Concerning Laugier's case he has this to say: "It is not rare to have in scapulalgias" ('Scapulalgies'),—an equally vague term in both English and French,—"which have become chronic, a subluxation forward and upward, which has acquired a certain importance on account of the mistakes to which it has given rise. The humeral head is elevated until it is almost in contact with the acromion, and is carried forward against the external border of the coracoid process, there is found in consequence a depression under the acromion, shortening of the arm, and limitation of its movements. It is really this condition, unless I mistake it, which Laugier has described as an incomplete upward and forward luxation, produced by traumatism."

Hamilton<sup>5</sup> devotes greater space to subluxation of the humerus than is found in any more recent treatise. It is possible in the following paragraph he refers to the same class of cases described by Malgaigne as chronic scapulalgies.

“The head of the humerus sometimes remains for a long time after the reduction of a dislocation has been effected, slightly advanced in its socket, so as to lead to the suspicion that it is not properly reduced. The same thing also has been noticed by me where the shoulder has been subjected to a violent wrench, but no actual dislocation has ever occurred. In either case the explanation is perhaps the same—the long head of the biceps has been broken or displaced, or when it follows a dislocation, some of the muscles inserted into the greater tuberosity have been torn from their attachments, yet the laceration of the capsule and the action of the muscles may alone be concerned in the production of this phenomenon.”

In the *Centralblatt für Chirurgie*, 1894, is an article by Paul Muller,<sup>6</sup> on traumatic subluxation of the humerus, which stands quite alone. Without much discussion of previous opinions he states simply his own that the condition is more frequent than generally accepted. In three years he had seen five cases of *omoplegia reflexa traumatica*, as he would otherwise term it. The first patient consulted him on the fourteenth day after falling down several steps onto the left shoulder. There was immediate loss of the use of the arm, considerable swelling and pain. On the fourteenth day following, the patient presented himself; the elbow was supported with right hand, rotundity of shoulder was gone, the upper arm was rotated in, but a deviation of the upper arm axis from the glenoid cavity toward clavicle was not noticeable, no abnormal protrusion of the scapula, flattening of the shoulder posteriorly was plainly seen, the finger-tip could be pushed deep under the acromion process, the head of humerus was advanced about 2 cm and closely applied against the coracoid process, the deltoid was slack. Active motion was impossible and passive motion painful, the displacement could be reduced but immediately recurred. Under chloroform there was free passive motion on replacing head, no exudate in the joint was demonstrable. The other cases were similar, the flattening of the shoulder was not at first seen, though in one case it was noted as early as the third day, this he thinks partly due to the con-

siderable swelling but chiefly to the fact that the subluxation is a secondary circumstance. The injury produces, Muller thinks, a reflex atrophy of the deltoid, supraspinatus and usually also the infraspinatus and teres minor—which in one case were markedly atrophied—through irritation of the sensory joint branches of the axillary and suprascapular nerves—the unopposed pull of the pectoralis major, latissimus dorsi and subscapularis producing the abnormal position of the head.

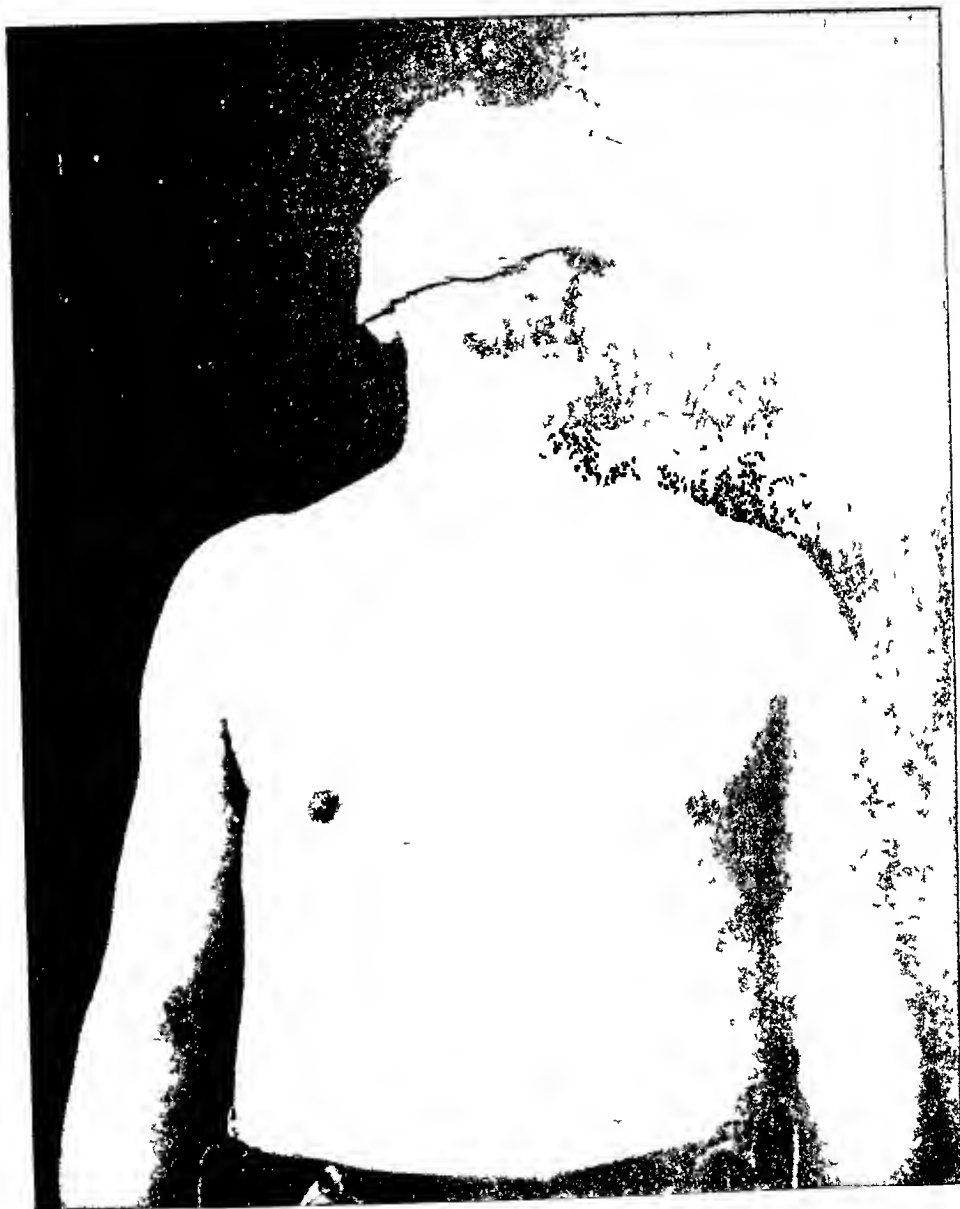
A case described by Snodden<sup>7</sup> in 1839 is of particular interest because of the findings when it came to autopsy six months later, from other causes. This patient fell backward, receiving the weight of the body on the right elbow, the shoulder, however, sustained the entire effect of the injury. The following morning the shoulder-joint was swollen and tender to touch and painful on very slight rotation, he could not place the arm over his head, though this was possible immediately after the injury. At the end of three weeks the swelling was less, but the tenderness, and pain on certain movements, had scarcely abated at all. There was a slight flattening on outer and posterior aspects of the joint, and the head of the bone looked as if it were drawn up higher in the glenoid cavity than it should be. “The head of the bone was unduly prominent in front, almost to the amount of a partial dislocation.” Abduction was limited to a very acute angle by the greater tuberosity coming in contact with the acromion. “For all useful purposes the arm was powerless—the man was unable to raise the smallest weights from the ground, otherwise, the underhand motions were not limited, the arm could be readily swung forward and backward. The locking of the humerus and acromion on abduction formed an insuperable opposition to all overhand motions.” The interesting finding at autopsy six months later was the dislocation of the long head of the biceps, from its groove, without other injury. From the close resemblance of this case to partial luxation of the humerus, Snodden was led to inquire how far a lesion of this tendon is involved in the production of subluxation. But in the seventy years which have elapsed, that inquiry has not been

definitely answered, for no similar clinical history has been recorded, followed by an autopsy record Agnew<sup>8</sup> was among those to answer it negatively. He writes "I have in at least three instances seen the condition present which is said to characterize this supposed displacement, and from the nature of the precedent injuries, I have been disposed to refer the anterior fulness on the inner aspect of the joint to the loss of power in the posterior scapular muscles, in consequence of which the head is drawn unusually inward by the subscapularis, and inward and upward by the clavicular fibres of the pectoralis major and deltoid muscles, and likewise, though in less degree, by the coracobrachialis and short tendon of the biceps."

After the report of Snodden's case, in the discussion of subluxation was incorporated renewed speculation as to the part played by the long head of the biceps in maintaining the head in its normal position and the symptoms resulting from its rupture or dislocation. This aspect of the discussion was based chiefly upon dissecting-room findings. Many different opinions were expressed: some that partial dislocation forward was due to rupture or dislocation of the long head of the biceps<sup>9</sup>, some that luxation of the long head of the biceps does not occur at all and cases so described are really instances of inflammatory swelling of the subdeltoid bursa<sup>10</sup> (Codman, *Bost Med & Surg*, May 31, 1906, recently called attention to the disability produced by inflammation of this bursa), some that the changes noted were the result of rheumatoid arthritis, etc., *i e*, that the luxation was pathological and not traumatic.

The subject of the accompanying photographs received this injury in a fall from his bicycle, on to the outstretched hand. It was regarded and treated as a sprain, all redness and swelling subsided in two or three days. Voluntary motion was abolished at first, but the next morning after a little massage some motion was possible. At the time of my first examination, seven and a half weeks after the accident, the use of the arm was so painful and limited he had not been able to return to his work as a plate printer. The under motions of the arm anteriorly were

FIG 1



Traumatic subluxation of the humerus

FIG 2



Traumatic subluxation of the humerus

unrestricted, but not so posteriorly. The greatest difficulty, however, was in raising the arm beyond the horizontal, extending the arm in front, if assisted beyond the horizontal he could continue to raise the arm to the perpendicular, and voluntary movements again became free. On comparing the two shoulders it was readily noted that the head of the humerus on the injured side was more prominent anteriorly, and on a higher level (Fig 1)<sup>1</sup>. A corresponding flatness posteriorly was not so noticeable. On extending the arms laterally to the horizontal, the deformity shown in the second photograph (Fig 2) immediately attracted attention, the greater tuberosity seemed to lock against the acromion process, impeding further independent movement of the humerus, beyond the horizontal. An X-ray negative showed there was no injury to the bony structure. Six months later the deformity had entirely disappeared and though the functional restoration was not perfect it was nearly so.

I had advised the patient he would probably recover the use of his arm in six months or a year, but having in mind the part the long head of the biceps was said by some to play in such cases, I thought possibly his convalescence might be shortened by an effort to repair that tendon, if ruptured. He sought other advice and decided against any operative interference, and I lost the opportunity of throwing some light on the pathology of this subluxation. One dissection convinced me a study of dissecting room material would not enable me to add anything to the contributions already made from such sources, and that an autopsy *in vivo* would alone clear it up.

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<sup>1</sup> The subluxation of the acromial end of the clavicle, readily seen in the first photograph, seemingly played no part in his disability



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# OCCLUDING PULMONARY EMBOLISM

BY WILLARD BARTLETT, M D ,

OF ST LOUIS, MO ,

Professor of Experimental Surgery in the Washington University,

AND

R L THOMPSON, M D ,

OF ST LOUIS, MO ,

Professor of Pathology in the St Louis University

CONSIDERING the fact that it was not until the first quarter of the seventeenth century that the circulation of the blood was established it is not surprising that over two hundred years more should have elapsed before it occurred to any one that this flowing stream could act as a means of transportation for solid particles set free in its current, and that such particles introduced into the blood might be found in some place other than the point of entry

So simple is the mechanism of thrombosis and embolism as it is taught to-day that we wonder why it was necessary for Virchow to establish the self-evident fact that injury to a vessel or changes in the blood sufficient to cause clotting at some particular point might be followed by dislodgement of a piece of this solid clot and that this broken off mass would be carried on by the blood stream until it reached a vessel too small for it to pass through and then stop. It is also plain that the blocking of a vessel by this solid mass would stop the circulation through this vessel and give rise to disturbances of great importance or of little importance depending on whether or not this vessel supplied an organ, the function of which was necessary to maintain life

In this paper we desire to discuss especially the instances in which venous thrombosis, in either medical or surgical cases, is followed by emboli of sufficient size or number to block completely the more important branches or the main stem of the pulmonary artery and cause sudden death

These cases, which we are to discuss, of complete blocking of the pulmonary artery by large masses of clot derived from a thrombus in a vein, which are frequently encountered by the surgeon near the operative area and which may result in death are by no means uncommon. They occur most frequently between the second and fourth weeks following the operation. The patient may die instantaneously or there may be a more or less prolonged respiratory struggle ending in death. This depends on whether the detached mass goes through the right heart intact in sufficient size to completely block the stem of the pulmonary artery or whether the first mass partially blocks the artery, or blocks one of its main divisions, and is followed by other masses, or coagulation of blood behind the first. If the trunk of the pulmonary artery is blocked so that both the main branches are closed death ensues immediately. In individuals suffering from weakened heart action of any cause sudden blocking of one of the main branches of the pulmonary artery may also result in sudden death. Strong heart action on the contrary may overcome the effect of the blocking of one of the main branches of this artery and the patient survive.

The autopsy findings in these cases so far as the lungs are concerned are scant. Occlusion of the trunk of the pulmonary artery does not give rise to infarction of the lungs. Infarction of the lung is only present when emboli have lodged in the smaller branches of the pulmonary artery. Cases are seen in which small emboli have preceded the final lethal embolus and caused hemorrhagic infarction of the lung, but these infarctions have no immediate part in causing death in such an instance. Only rarely are they found in connection with the type of pulmonary embolism with which we are dealing and then usually when there is thrombosis of several veins at the operative site. Any of these thrombi may give rise to emboli and a small embolus might have been carried to the lung at any time from one of these thrombi wholly independent of the embolus that caused death.

In autopsies on cases of death from pulmonary embolism

the pulmonary artery should always be opened *in situ* before the heart is removed or cut into, as the site of the embolus is usually at the point where the vessels are cut in removal of the heart. If this is not done, the embolus, which may have had no time for attachment, can easily slip out unobserved and be entirely overlooked by the pathologist.

The origin of the embolus, while it might come from any part of the systemic venous system or the right heart, is most frequently found in the veins of the lower extremities, in the deep epigastric and pelvic veins, or in the mesenteric veins. In our medical cases the thrombus was found the most times in the right heart.

Albanus gives as prevailing causes for thrombosis after laparotomies, sepsis, heart imperfections, pressure of tumors on veins, cooling and handling of blood vessels while the abdomen is open, the effect of narcosis on the heart, the recumbent position and the pressure of a bandage. He overlooks what we believe to be a most fruitful cause of the condition, varicosities on veins which are directly affected by the operation. On the operating table it is not uncommon to see greatly changed veins carrying the blood from large tumors and in one instance at least, No. 2 of our series, we were able to demonstrate both at operation and autopsy these varicose veins and their causal relation to fatal embolism.

All lung symptoms, according to Gussenbauer, which arise after the release of incarcerated hernia are to be regarded as embolic in nature. Other surgeons go equally far in connecting this subject with abdominal surgery. It is the practice of the Mayos when resecting the stomach to invariably cauterize the cut edges of that viscus to prevent septic pulmonary embolism. (Personal communication.) Since doing this, they see pneumonic emboli following such operations less frequently than formerly. As Albanus, quoted above, states, sepsis is naturally to be thought of as a factor in these cases. Hence one is not surprised at the remark of Sonnenburg, that 5 per cent. of all appendix operations are attended with thrombosis somewhere in the vicinity.

The reason for the greater number of cases given in the literature as showing thrombi originating from the femoral, epigastric and pelvic veins, as far as the surgeon is concerned, is due to the fact that pelvic and abdominal operations are much more frequently performed than operations in other parts of the body. Operations elsewhere, where veins are subject to trauma or infection are as apt to be followed by thrombosis and subsequent pulmonary embolism as they are in the before mentioned situations. This may be illustrated by the following case

('057) Male, age 70 years *Larynx removed for carcinoma Eight days later sudden death* Autopsy four hours after death showed the trunk of the pulmonary artery occluded by partially organized blood clot, 1.5 cm in diameter. The clot extended into both the main divisions of the artery. The lungs were œdematous and congested. The right heart was distended and filled with blood. The neck was swollen and œdematous. Operative wound at site of larynx showed some superficial necrosis with healthy appearing granulation tissue below. On the right side, the internal jugular vein was distended to a diameter of 3 cm and was occluded by a solid grayish granular thrombus for a distance of 8 cm. The neighboring tissue was stained by blood pigment. Anatomical diagnosis. Thrombosis of internal jugular vein with resulting occluding embolism of pulmonary artery.

The frequency of pulmonary embolism (including the cases of embolism of the smaller branches of the pulmonary artery that give rise to little or no permanent after-effect) is much higher than is usually supposed in both surgical and non-surgical diseases. Virchow found that in ten cases of thrombosis of the veins of the lower extremity, six were followed by pulmonary embolism. Albanus found that 43 per cent of the cases showing thrombosis after laparotomies were followed by pulmonary embolism. (This amounted to only 2 per cent of the operated cases since only 53 cases of thrombosis were found in 1140 laparotomies, 23 of which were followed by pulmonary embolism.) On the contrary Quenstedt and

also Leichtenstein found pulmonary embolism in 20 per cent of their cases of thrombosis. Opposed to this again is the record of Lubarsch, who in 584 cases of thrombosis found pulmonary embolism 347 times, i. e., in 59.1 per cent of his cases.

In none of these instances is it stated how frequently the embolus was of sufficient size to cause death by blocking the pulmonary artery. These cases are not rare and from those that have been reported a few may be cited.

Welch has collected twenty-three cases of venous thrombosis in which there were at least 3 deaths due to pulmonary embolism consecutive to the thrombus. Mynter mentions a case in which sudden death was probably due to pulmonary embolism following thrombosis of the femoral vein in appendicitis. Robinson describes a typical death from pulmonary embolism seventeen days after hysterectomy. Koenig reports a case where the patient died from pulmonary embolism although the thrombosed vein (saphenous) had been removed for the purpose of avoiding just such an untoward outcome. In this instance the clot probably extended into the femoral vein and was therefore not totally extirpated.

From the cases that have occurred in the practice of one of us and from cases that came to autopsy at the Boston City Hospital, most of them during the service of Dr. Thompson, and for which we wish to express our indebtedness to Dr. F. B. Mallory, we append the following list:

1 *Carcinoma of Larynx*—(Autopsy, Thompson) Death instantaneous eight days after operation. Occlusion of main stem of pulmonary artery by embolus. Thrombosis of internal jugular vein.

2 *Myoma of Uterus*—(Autopsy, Thompson) Death sudden thirteen days after operation. Occlusion of both branches and trunk of pulmonary artery by embolus. Thrombosis of ovarian veins.

3 *Compound Fracture of Leg*—(Autopsy, Thompson) Death thirty minutes, eight days after injury. Main trunk and right pulmonary blocked by embolus. Thrombosis right heart. Culture from heart's blood sterile.

4 *Contusion of Knee*—(Autopsy, C W Duval ) Time in dying thirty minutes Embolus of trunk and branches of pulmonary artery Thrombosis of right femoral

5 *Appendectomy*—(Autopsy, Dr Brinkerhoff ) Death in five minutes, eight days after operation Complete embolism of main trunk of pulmonary artery Abscess at appendix site

6 *Gangrene of Heel, Myocarditis, Alcoholic Neuritis*—(Autopsy, Dr S B Wolbach ) Eleven hours in dying Embolism of branches of pulmonary artery except branch to upper lobe of right lung Thrombosis of femoral, external pudic and profunda Culture from heart's blood sterile

7 *Appendectomy*—(Autopsy, Dr Marchildon ) Died in ten minutes, fifteen days after operation Occlusion of both branches of pulmonary artery by embolus Thrombus not found

8 *Uterine Myomata and Gall-stone Disease*—(Autopsy, Dr Tiedeman ) Six days after operation collapse with recovery four days later another attack of similar nature, and in two more days (two weeks after the operation) pulmonary embolism with death in thirty minutes

9 *Clinical Diagnosis Hemorrhagic Pleurisy*—(Autopsy, Dr Brinkerhoff ) Autopsy findings scant save for thrombosis of left pulmonary and popliteal arteries Embolism of right pulmonary Death sudden Culture from thrombus show colon-like bacillus

10 *Tuberculosis of Lungs*—(Autopsy, Thompson ) Embolism of left pulmonary artery Two hours in dying Cultures from heart's blood show streptococcus

11 *Bronchopneumonia and Acute Otitis Media*—(Autopsy, Thompson ) Embolism both branches of pulmonary artery Five hours in dying Culture from heart's blood sterile Middle ear streptococcus and staphylococcus aureus

12 *Typhoid Fever*—(Autopsy, Dr E E Southard ) Complete blocking of pulmonary artery by embolus Death in fifteen minutes Thrombosis of right common and internal iliacs

13 *Myocarditis, Aortic Endocarditis, Hypertrophy and Dilatation of Heart*—(Autopsy, Thompson ) Embolism of branches of pulmonary artery to lower lobes only, with hemorrhagic infarction Twelve hours in dying Thrombosis of right heart (Death in this case due to weak heart as embolism not sufficient to cause death under ordinary conditions )

14 Similar to last case *Myocarditis, Hypertrophy and Dila-*

*tation of Heart* — (Autopsy, Dr H A Christian ) Embolism of branches of pulmonary artery with hemorrhagic infarctions, both lower lobes and upper left lobe of lung Death sudden Thrombosis of right heart

15 *Umbilical Hernia and Talma Operation for Cirrhosis of Liver* — This patient experienced all the typical symptoms of pulmonary embolism with sudden death as did those whose records succeed this one except two to be mentioned later He was operated upon for a large umbilical hernia and at the same time the Talma operation for cirrhosis of the liver was performed Eleven days after the operation he suddenly became breathless, cyanosed, and in ten minutes was dead No autopsy could be obtained in this or the succeeding cases, hence they are submitted not as proven instances of pulmonary embolism but as suggestive cases in surgical practice in which a better explanation for death cannot be given

16 *Hysterectomy for Carcinoma* — A lady fifty-six years of age was operated upon by the Wertheim method for cancer of the uterus No unusual features marked her convalescence She was up on time and when preparing to go home four weeks after the procedure, suddenly dropped to the floor while crossing the room, gasped for breath and was dead in thirty minutes

17 *Resection of Stomach for Carcinoma* — A man sixty-eight years of age suffering from cancer of the stomach underwent a resection without shock or subsequent ill effects for three days He was sitting up in bed talking to his nurse, having taken liquid nourishment and being entirely without abdominal symptoms, when suddenly he became unable to get his breath, as the nurse related, dropped back deeply cyanosed and died a few minutes later

18 *Hysterectomy for Carcinoma* — Another Wertheim operation for cancer of the uterus done on a lady forty-four years of age resulted in sudden death in very much the same way Ten days after the operation she was sitting up in bed having just partaken of a light lunch, when suddenly she began to breathe with great difficulty, extremities became cold, every evidence of extreme shock appeared and in eleven hours she was dead

19 *Umbilical Hernia* — An operation for umbilical hernia on a lady fifty-two years of age was attended by a somewhat similar set of symptoms but resulted favorably Eight days after the



Mayo overlapping operation there was a sudden onset of the manifestations just related. However, under stimulating treatment she gradually began to breathe more easily and in twenty-four hours was considered out of immediate danger. She gradually improved, left the hospital a month later and has remained well ever since.

20 *Appendectomy*—A man thirty-eight years of age was operated upon for appendicitis in the interval. The procedure was very difficult and consisted of the removal of a stiff, tightly adherent appendix. His recovery was devoid of any untoward incident up to the ninth day, when being allowed to get up for the first time he suddenly became intensely cyanotic, breathless, unconscious and died in a very few minutes.

21 *Intestinal Resection* with Murphy button anastomosis was done on a man fifty-four years of age and two days later, while he was normal, apparently comfortable and conversing with one of us, he suddenly gasped for breath, became blue, unconscious and was dead within five minutes. This case was clearly one of some form of suffocation. However, there was no obstruction in the air-passage, since a knife that happened to be handy was plunged into his trachea and one lung inflated through catheter, hence this suffocation can only be regarded as due to the sudden interruption of the oxygen carrying blood stream.

22 *Varicose Veins of Leg*—A lady forty-seven years of age was operated upon for varicose veins on the lower leg. A combined Mayo-Schede operation was performed. The same evening she became suddenly cyanotic, complained of shortness of breath, pain and compression in the chest, intense anxiety was present, extremities became cold, but the symptoms rather rapidly disappeared and as yet no further danger of this kind has been encountered. She is, however, in the hospital at the time of writing.

It may be of value in the sixteen surgical cases to note the interval of time that elapsed after operation or injury before the onset of pulmonary symptoms. In two of these this feature is not noted in the records, hence but fourteen are left for our consideration. In these cases this period was as follows

One, one day, one, two days, one, three days, one, six

days, four, eight days, two, nine days, one, eleven days, one, thirteen days, one, fifteen days, one, twenty-eight days

An average shows that a little less than seven days intervened as a rule between the time of operation or injury and the lodgment of the blood clot in the pulmonary artery. It should be noted that in those cases where embolism occurred a few days after operation that the condition was such that thrombosis may have been present some time before operation.

Twenty of the twenty-two cases cited resulted fatally. In this connection it is interesting to note the time intervening between the onset of symptoms and the occurrence of death. These are given as found in the hospital records.

Three, suddenly or instantly, one, almost instantly, one, few minutes, three, five minutes, two, ten minutes; one, fifteen minutes, four, thirty minutes, one, two hours, one, five hours, one, eleven hours, two, twelve hours.

As far as the symptoms of thrombosis preceding pulmonary embolism are concerned, Lotheisen has very properly remarked that they very often fail entirely. However, Schachtler has made some very interesting observations which may be of value in this connection. He had the opportunity of studying seven cases at Zurich and noted that the temperature remained normal in all of them while the pulse gradually rose in a step-like (*staffelfoermig*) manner, until the lung symptoms became manifest. He regards this change in the pulse as indicative of thrombus formation.

The symptoms of pulmonary embolism cannot fail to be burned into the memory of one who has ever seen a patient die as a result of this accident. The seemingly normal individual suddenly becomes breathless, cyanotic, anxious, restless, complains of pain and oppression in the chest, the pupils grow wide, cold sweat pours and unconsciousness quickly supervenes. The pulse in many instances becomes rapid and irregular to the point where it cannot be counted at all. In one case which we have mentioned we had apparent complete blocking of the main trunk where symptoms of complete suffocation suddenly appeared, the pulse, as might be expected when air is instantly

cut off, became slower and less compressible. The symptoms in general are analogous to those which are seen when one of the main branches of the pulmonary artery is ligated in a dog. The rapid over-distention of the right ventricle which ensues is accompanied by a lowering of arterial blood pressure and a tremendous rise of venous pressure. Whether cyanosis, dyspnoea and failing pulse are referable to asphyxia or cerebral anaemia or interference with the coronary circulation or to all three together is, according to Welch, neither easy nor important to determine.

Unfortunately the treatment of such conditions must be largely of a preventive nature. A very strong heart may tide over an individual in whom only one branch of the artery is occluded and consequently the opinion is general that every heart should be aided as much as possible by stimulation. However, not much is to be expected in most instances. In order to prevent just such accidents, Mueller cites cases in which he ligated quite a number of varicose veins in the lower extremity, while Kiamei split varicose saphenous veins in fifty instances and evacuated thrombi to prevent pulmonary embolism, as well as the local effects of the disease. He was successful in every instance. Becker advises the removal of the saphenous vein when the thrombus has not extended into the femoral vein. It has recently been suggested that the pulmonary artery may be opened and the embolus removed.

Our own suggestion prompted by more than one of the cases above recorded relates to varicose veins in the vicinity of abdominal tumors. Not infrequently are these seen in the female pelvis, especially in connection with myomata of the uterus. They should if possible be extirpated with the growth, or at least ligated as far out as possible toward the pelvis wall, to avoid the likelihood of thrombosis (if they are left behind) with a subsequent fatal accident of the most distressing nature.

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# PRIMARY CARCINOMA OF THE HEPATIC DUCTS

THE REPORT OF A CASE WITH THE AUTOPSY

BY CHARLES L SCUDDER, M D,

OF BOSTON, MASS,

Surgeon to the Massachusetts General Hospital, Lecturer in Surgery,  
Harvard University Medical School,

AND

OSCAR RICHARDSON, M D,

Assistant Pathologist to the Massachusetts General Hospital

THIS case is recorded because of the unusual origin and location of a primary carcinoma of the biliary passages—exactly at the termination of the larger hepatic ducts

This case is of interest clinically because it illustrates an exception to Courvoisier's law. No palpable gall-bladder existed previous to death. At autopsy no over-distended gall-bladder and no gall-stones were found. The woman died after an exploratory incision probably from shock contributed to, somewhat, by the slight oozing of blood found at the autopsy. There were no signs of active hemorrhage previous to death.

M. M., a woman 55 years old, married. M. G. H. record No 151915

*Previous History*—She had had grippe seven years ago, malaria with chills upon several occasions and during the past fifteen years chronic gastritis. The catamenial period ceased three years ago. Two months ago the skin was slightly yellow. Ten days ago there was rather a sudden decided jaundice. The urine showed evidences of bile. The patient has lost ten pounds in weight during the last two months. She was quite thin. The skin and conjunctiva were deeply jaundiced. The liver could just be felt beneath the right costal border.

With this brief history and physical examination it was thought the woman had a malignant growth in the liver, in the neighborhood of the larger hepatic ducts, although a stone in the common duct was considered a remote possibility, even though there had been no attacks of pain at any time.



FIG 1



Primary adenocarcinoma of the hepatic ducts. Note the location of the new growth in the liver section. H, hepatic duct; Cg, cystic duct; Co, common duct; A, gall bladder; B, tumor. (Photographed by Mr. Brown, Pathological Laboratory, M. G. H.)

The abdomen was opened and a tumor felt at the termination of the hepatic ducts. The abdomen was closed carefully by layer sutures. The woman died two days later. The report of the autopsy follows.

*Autopsy* made and reported by Dr. Oscar Richardson, March 18, 1907, 6 hours postmortem.

*Anatomical Diagnosis*—*Adenocarcinoma of the Hepatic Bile Duct with Occlusion. Icterus. Operation Wound. Hemorrhage into the Peritoneal Cavity. Arteriosclerosis of the Aorta.*

A woman, 55 years of age, 150.5 cm long, well developed and fairly nourished. The tissues of the marginal wall of the wound show considerable infiltration with blood. The peritoneal cavity contains a slight amount of free blood and a larger amount of frank clotted blood. This clotted blood is mainly situated about the liver and flattened masses of it rest between the liver and diaphragm, completely covering over the surface of the liver. The omentum, in the region of the liver, shows considerable infiltration with blood and on the under surface of the liver nearby there are several small thick masses of clotted blood measuring 3 or 4 cm in greatest dimension. The anterior margin of the right lobe of the liver is at about the costal border in the right mammillary line. The stomach and intestines on section present no lesions.

*Liver*—Weighs 1275 Gm. On section the tissue is firm and shows generally marked green mottling. No stones in the gall-bladder. The common bile duct and the hepatic duct outside of the liver are free and not remarkable, except that there is a very slight amount of soft, rather foul, semi-fluid material in the common bile duct. At the point of entrance of the hepatic duct into the liver the lumen of the duct does not allow the passage of the smallest probe.

Dissection of the liver shows in the region mentioned a firm gray-white mass of new growth-like tissue fairly well marked out from the surrounding liver tissue and measuring about 3.5 cm in each dimension. The tissue of this new growth-like mass is apparently continuous with the tissue of the wall of the hepatic duct where it is lost in the mass by which the duct is occluded. On the anterior surface of the left lobe of the liver near its margin there is a small grayish area which on section is seen to be the outer surface of a small, firm, gray-white mass of new growth-like tissue fairly well marked out from the surrounding liver tissue (Fig. 1).

In the lesser omentum posterior to the posterior wall of the duct, at the junction of the hepatic and cystic ducts, there is a very small, rather firm, gland-like mass of tissue. On section it is not remarkable. No tissue of new growth is found in any of the tissues of the body other than in the hepatic bile duct and the liver.

*Microscopical Examination*—Sections of the tumor show typical adenocarcinoma in which the stroma is not excessive in amount. The tubules are generally formed by rather low epithelium and contain considerable mucin-like material.



# THE OPERATIVE TREATMENT OF INTRACTABLE VOMITING, NOT DUE TO PYLORIC OBSTRUCTION—NEUROSIS OF THE STOMACH

BY WILLY MEYER, M D,

OF NEW YORK,

Professor of Surgery at the New York Post Graduate Medical School and Hospital,  
Attending Surgeon to the German Hospital

AMONG the benign diseases of the stomach, in which surgical aid may have to be invoked to effect a cure, is one that seems to me of sufficient interest to be assigned a special chapter in the group of borderland cases, namely, the intractable, irregular vomiting, not due to pyloric obstruction, the so-called neurosis of the stomach. It consists in frequent attacks of extreme gastric pain, and irregular vomiting, sooner or later after the partaking of food. Most careful analyses of the stomach contents fail to reveal any disease, except, perhaps, now and then some hyperacidity. On abdominal section a thorough search of the entire accessible part of the stomach and duodenum, anteriorly as well as posteriorly, fails to reveal the slightest abnormality.

The disease is found in women, more frequently unmarried ones.

We are in the habit of calling such a complex of symptoms "neurosis of the stomach," a disease which, surely, forms a clinical entity. But, inasmuch as I have failed to find the latter point brought out in any of our surgical text-books, I thought it might not be amiss to discuss the subject from the standpoint of a real ailment, that is entitled to all consideration, the same as any other such recognized disease.

Neurosis of joints, especially of the knee and hip, also principally, if not exclusively, seen in the female sex, is a well-known trouble, although it is often not recognized by the family physician. A number of such cases that had been

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\* Read at a meeting of the New York Surgical Society, Feb. 12, 1908

incorrectly diagnosed have come under my personal observation in the course of the years. Yet, the history of such cases plus thorough examination ought to promptly show the exaggeration of the symptoms on the part of the patient, as well as the perfect health of the respective joint. Firm and encouraging talk, without betraying the true condition of affairs to the patient, and immediate, insistent treatment, will quickly cure the patient who may have been bedridden for months and may have disturbed and alarmed her surroundings by her frequent intolerable shrieking. The patient is asked to get up at once, the consultant insisting upon her ability to do so. He then may offer her his arm for support and makes her walk, if possible at once up and down the stairs. She soon recognizes that he is right, that she can do as he suggested. This, with some additional general advice, will speedily effect a permanent cure.

However, with the stomach, this is different. Here we are unable to demonstrate anything, all that could possibly be advised, has already been tried by the internal physician. An assurance that the trouble will pass over will almost invariably end in failure, in fact, will only make things worse. Surgical work alone, *i e*, an operation consisting in opening the abdomen can, and usually does effect a cure.

Such an operation will, of course, reveal some adhesion or kinking of some kind, which was responsible for the symptoms. With the assurance of the correction of the abnormality, relief sets in and a permanent cure usually results.

A brief description of a few cases that have come under my own observation within the last five years, will illustrate the peculiarities of the trouble and its simple surgical treatment.

CASE I—Female, 22 years of age, father died of cancer of the stomach. Patient suffered from frequent attacks of gastric pains and irregular vomiting after meals, some blood, but not characteristic, no appetite, material loss of weight. Ulcer treatment, with protracted rectal alimentation faithfully carried out, vomiting continues. Acidity rather reduced, marked tenderness

in epigastric region    Probable diagnosis    Ulcer, exceptionally with low acidity

As the six months' almost uninterrupted, most careful treatment had failed to improve the condition, and the patient continued to lose, but had to return to work, operation is decided upon, and done in December, 1903. Thorough examination of the stomach, both anteriorly and posteriorly, by inspection as well as palpation, fails to reveal the slightest pathologic change, there is no adhesion, no infiltration, no scar formation, in short, the condition found on operation is absolutely normal, clinically. The abdomen is closed. The patient is told that the expected ulcer was found and attended to, with the result that the vomiting promptly stopped. She soon resumed her work and has been well ever since, with the exception of some hyperacidity which has recently been noticed.

This case made a lasting impression upon my mind. We all had expected to find at least some ulceration or its sequelæ, and yet nothing could be found. We, therefore, could not possibly explain the phenomenal result in any other way, than by assuming that we had had to deal with a neurosis, although the patient was a very sensible young lady who was thoroughly wrapped up in her work. I recognized that this disease represents a typical, clinical picture and decided not to refuse any operation in similar cases, but, on the contrary, to rather encourage it, provided the possibilities of internal treatment have been exhausted. This, of course, would mean widening the indication for surgical work in these benign borderline cases.

It was almost three years before a similar case came under my care.

CASE II —A young lady of 23, engaged to be married, who had had rheumatism when three years of age. She suffered from persistent slight mitral insufficiency, frequent headaches, hyperacidity, frequent irregular vomiting after meals, which was now and then tinged with blood. A most careful regime, especially as regards diet, was ordered by her physician, in consequence of which she naturally lost some weight, now and then she had

"fainting spells" The gastric pains complained of did not occur during or immediately after eating, but often one-half hour following the ingestion of food, making the diagnosis of ulcer rather doubtful. All symptoms increased in spite of a prolonged stay in the country, and the patient was brought to the hospital, ready to have anything done that promised relief. She declared she "would rather die, than continue to live in that wretched condition," and insisted upon an operation, refusing to wait for the return from the country of the originally consulted surgeon. So the case came under my care. Reluctantly I agreed to perform the operation in view of the diagnosis of neurosis, that had been made. Yet, mindful of the splendid result of abdominal section in my former case, I consented.

Operation showed not the slightest pathologic change on most careful search of the organ as far as it could be reached with the eyes and hands. Hence, the abdomen was closed and the patient told that an adhesion near the pylorus which evidently had been the cause of all her trouble, had been severed and that she was now bound to get well. From the day of the operation improvement set in. However, on the tenth day after operation an old medical friend of hers visited her and, not having been warned, said to her in a jocose manner "Well, well, you are a nice girl, to suffer so much, and then nothing is found at the operation." Right after his departure the old trouble recurred, pain, vomiting, etc., set in again. When I called, having been informed of what had happened before entering her room, I addressed her most seriously, saying that the doctor was mistaken, not having been present at the operation, and that I could but repeat the correctness of my former statement. My assurance had the desired effect, improvement again set in and she soon left the hospital in perfect health, got married and has been well ever since.

CASE III—Female, 22 years old, school teacher frequent attacks of pain in pit of stomach since two years, usually increased after meals, also nausea and vomiting, oppressive feeling when lying on back, two weeks ago some blood appeared in vomitus, heart, lungs and kidney normal, no movable kidney. Three years ago, appendix was removed by another surgeon, without improving condition, organ was found little changed, some slight adhesions only being encountered. Of late slight rise of tempera-

ture at night. Careful analysis of stomach contents showed reduced acidity, leucocytes 33,600, polynuclear 84 per cent. Inflammatory condition suspected, perhaps cholecystitis. Operation April 19, 1907. Nothing abnormal was found. Yet the effect of the operation was simply magical. Bowels soon moved regularly, appetite became good and food was retained, the oppressive subjective feeling as well as the tenderness in the pit of the stomach disappeared. Diagnosis: neurosis.

Inquiry shows that patient has remained cured of her old trouble, but, being a neurasthenic, she has since developed some spinal symptoms.

CASE IV—Female, 28 years of age, has suffered periodically for the last two or three years of gastric pain and vomiting, claims to have vomited a quart of blood several weeks ago, necessitating confinement to bed, and rectal alimentation. Careful diet since, pains continue, setting in shortly after the ingestion of food and lasting two to three hours, when vomiting relieves the same. Examination shows the epigastric region very tender to the touch, stomach enlarged, chemical examination negative, motor function unimpaired, slight hyperchlorhydria. Administration of large amounts of bismuth brings no relief. Vomiting and pains continue unremittingly. Careful ulcer treatment for over a month, at the hospital, when another hæmatemesis set in, the blood being intimately mixed with the food. Again rectal alimentation. As soon as feeding by mouth was resumed, blood again was vomited. Considerable loss in weight. Diagnosis: Ulcer of stomach, without pyloric stenosis. Operation advised and done by me about a year ago. Finding absolutely negative, as far as direct examination could be carried. In view of the possibility of the presence of an ulcer further down in the duodenum, gastro-enterostomy (with short loop and suture) was done. This, however, only tended to aggravate the trouble, vomiting and pain continued, blood often being admixed with the fluid returned. The patient continued to lose ground, in spite of frequent hypodermoclyses, rectal alimentation, etc. Evidently, the artificial anastomosis had made matters worse. When it became evident that it would be advisable to destroy the same and restore former anatomical relations, it was too late, the patient was too weak to stand another surgical intervention, and died six weeks after the operation. Unfortunately, a post-

mortem was not permitted, even wound inspection was denied. The suggestion was made that the bleeding might have been caused by varicose veins in the neighborhood of the cardia.

Of course, this case does not really fit into the frame of the clinical picture under discussion. Nevertheless, I thought it advisable to put it in, as the symptoms shown were very similar to those observed in the other cases, only more aggravated.

I feel positive that the patient would have had a far better chance of recovery, had I closed the abdomen after the negative finding of local inspection and manual examination.

Dr W F Mayo, of Rochester Minn., and Dr George E Brewer, of New York, have reported similar cases, in which gastro-enterostomy failed to bring relief or made matters worse.

CASE V —Female, aged 20 years, well until about four years ago, when vomiting set in shortly after meals. Patient has seen many physicians, also went to hospital where stomach contents were carefully analyzed with negative result as to pathologic changes and operation was proposed, but not accepted. Vomiting continued, never admixed with blood, pains especially severe at time of menstruation, always more pronounced on right side. These symptoms continued for a whole year, when improvement set in and the patient was well for two years, after which period the rebellious stomach condition returned, though it was limited to the time of menstruation. For the last eight months the pains in the right side, too, have returned and with it the vomiting and gastric pain, the latter evidently not dependent upon the ingestion of food, certainly not increased after meals. Vomiting occurs irregularly, from five minutes to two hours after eating. No movable kidney. Greatest tenderness in appendix region, somewhat less in epigastrium, but the entire abdomen is more or less tender. The patient distinctly gives the impression of an hysterical girl. In view of the fact that a brother had recently died after an operation for appendicitis at one of our public hospitals, the patient was worried principally by the thought of having the same disease which, certainly, could not be absolutely excluded.

Therefore, removal of the appendix was advised, with the idea (though not expressed) of testing the result of the operation upon the stomach trouble, should the appendix be found not to have been the cause of her symptoms. Thus, in October, 1907, appendectomy was done. The organ was slightly thickened and adherent but, from a surgical point of view, not sufficiently diseased to account for symptoms. Nevertheless, immediate improvement set in, the patient was able to freely partake of unselected food without ill after-effects, pains ceased, when suddenly, about four weeks later, without any known reason, all former symptoms returned, but in milder degree. She called in her family physician who prescribed and then sent her to me. I endorsed the doctor's prescriptions, spoke to her hopefully, weighing my words most carefully. Still, it seems I did not encourage her sufficiently. For, as the mother told me, immediately after her return from my office, all symptoms got worse and she fell back into her former state. Being convinced that the diagnosis of neurosis was correct and, unwilling to repeat a long-continued local lavage treatment as previously employed by another colleague, without result, I insisted upon abdominal section which was done five weeks after the first operation. It showed the stomach absolutely normal, no infiltration, no adhesions of any kind, in fact, it presented not the slightest clew for any of the symptoms observed. Nevertheless, improvement was prompt and the patient has remained in this good condition up to the present time.

Of course, in view of the impossibility of furnishing proof for the assertion, it is difficult to maintain that the disease in question is entirely of nervous origin. It might be claimed that a single (or multiple) superficial mucous ulcer—though not found—may yet have been the cause of the clinical signs. However, personally, I am absolutely convinced that the symptoms complained of were not dependent upon a pathologic change, with the possible exception of Case IV, which, as will be remembered, was rather doubtful.

It cannot be gainsaid that the cause of the prompt improvement following abdominal section in these cases is somewhat obscure, most probably it is of mental character, the patient's mind being set at ease by the attending surgeon's

confident assurance that now, the cause of all her trouble having been found, everything *must* be all right. Still, it may be that the handling and stretching of the gastric walls, or the entrance of air into the abdomen exerts a curative influence. Be this as it may, the principal factor in the cure of these cases is surely the operation *per se*.

My main purpose in writing these lines is *first*, to recall to the mind of the general practitioner, the fact that cases like those described, clearly belong to the borderland, and that, after he has exhausted all means at his disposal, a mere abdominal incision which, as a matter of course, *will reveal* some kinking or adhesions, is apt to permanently cure the patient, *second*, to impress upon the surgeon, that it is unwise to refuse operation, *third*, that gastro-enterostomy in these cases is clearly contraindicated, in fact, may result fatally. It is indicated only in cases of pyloric stenosis and for the purpose of putting at rest recurrent gastric ulcers that may have developed in the distal part of the stomach.



# THE VALUE OF ENTEROSTOMY AND CONSERVATIVE OPERATIVE METHODS IN THE SURGICAL TREATMENT OF ACUTE INTESTINAL OBSTRUCTION,

WITH REMARKS ON THE IMPORTANCE OF OPERATIONS IN TWO STAGES \*

BY CHARLES A. ELSBERG, M.D.,

OF NEW YORK,

Adjunct Attending Surgeon to Mt. Sinai Hospital

IN spite of the advances that have been made in methods and technic, the mortality after operative interference in acute intestinal obstruction is still a very high one. In the hands of different operators the mortality has varied between fifty and seventy per cent. Of 100 cases treated by operation, during 1906, in three large hospitals of this city, 54 per cent died. Ranzi has recently collected 758 cases from literature, with a mortality of 57 per cent.<sup>1</sup> Other reports give a still higher death rate.

The majority of the patients present,—when seen by the surgeon,—advanced symptoms of obstruction, relatively few come to operation early when the manipulations necessary for the finding and relief of the obstruction are well borne.<sup>2</sup> This is due in many cases to the difficulties in making an early diagnosis, sometimes to delay on the part of the patient, sometimes to the very rapid progress of the symptoms.

Even if the very advanced cases—those in extremis—are excluded, the mortality after operations for acute intestinal obstruction will still be found to be a very high one—30 to 40 per cent. From the medical standpoint, this mortality can be diminished only by improvements in diagnostic methods, so that the patients can be referred to the surgeon more early, from

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<sup>1</sup> Among these cases were included strangulated hernia, acute pancreatitis, etc.

<sup>2</sup> In only about 10 to 15 per cent of the cases admitted into Mt. Sinai Hospital is the patient's condition still to be called a good one.

the operative standpoint, the number of operative failures can only be decreased by greater simplicity in operative manipulations

In a relatively small number of patients, the general condition is still a very good one, so that radical operative interference is fully justified. In the desperate cases all that can be done to relieve the urgent symptoms is to open and drain the bowel. There are a large number of cases, however, which, in point of severity, may be placed midway between those in desperate and those in good condition. These are usually subjected to radical operative interference. During the past two years, the writer has operated upon a number of such patients by performing an enterostomy of the most distended coil of intestine which presented when the abdomen was opened. No search was made for the cause of the obstruction nor was any effort made for its relief—unless the obstruction was at once met with and the freeing of the bowel a very simple matter. The cases herewith reported will show that the results were very satisfactory ones.

The operative indications in acute obstruction of the bowels are two-fold, the relief of the obstruction, and the withdrawal from the body, as rapidly as possible, of the retained and poisonous intestinal contents. It is now recognized that the presence of the retained intestinal contents is a very great, if not the most important factor in the production of grave symptoms. Powerful poisons are produced by the changes which the intestinal materials undergo, poisons which have a baneful influence not only directly upon the intestinal muscle, but also—as they are absorbed—upon the nervous system and upon the cardiac muscle (Albeck, Clairmont and Ranzì, Kukula, Nesbitt, etc.). The sudden strangulation of a loop of gut—under a band, for example—may cause considerable abdominal shock, but how much more grave is the increasing shock from the virulent poisons formed in the obstructed bowel! The distention of the intestine with gas adds its deleterious effect, not only by pressing upward against the diaphragm, interfering with respiration and the

heart's action, but also by disturbing the circulation of blood in the bowel wall. This is in turn (Kader) followed by a formation of more gases and by increased distention. In most cases of acute intestinal obstruction, therefore, the gravity of the symptoms is due to those conditions which follow the obstruction rather than to the obstruction itself.

When the significance of the poisoning from the retained intestinal contents began to be recognized, and attention was turned to the question of their rapid elimination, it was thought that the best way to rid the body of these substances was by increasing peristalsis after the obstruction had been relieved [enemata, cathartics, injection of magnesium sulphate into the bowel (McCosh), etc]. In many patients the operation for the obstruction was well borne, but death occurred after a few hours. Clearly, in not a few patients, this was due to the rapid absorption of the toxic substances by the healthy gut below the obstruction. Most operators then made it a rule,—either before or after the search for and relief of the obstruction,—to empty the distended loops of intestine of their gaseous and fluid contents by aspiration or incision followed by suture (McCosh, Mikulicz, Lennander, Dahlgren, and many others). This is the procedure most in vogue to-day. Another plan and one that has contributed much to diminishing the operative mortality, is to drain the intestine above the site of the obstruction at the same operation at which the obstruction is relieved. It would always be preferable to do the enterostomy first, if it were not that such a drained loop is often in the way in the search for the obstruction. Besides, there is the danger that the tube in the bowel may be disturbed during the manipulations, and a soiling of the peritoneal cavity occur. Therefore, one is apt to delay the opening of the bowel until after the obstruction has been relieved, or to close the opening before looking for the obstruction.

It is pertinent, therefore, to inquire whether,—in all patients, whose strength is at all diminished by the shock of the obstruction and the poisoning from the toxic materials

in the intestine,—better results would not be obtained if the surgeon always chose the simplest method for the relief of the intestinal retention. In other words, if the simple operation of opening and drainage of the bowel were done more often, we would more rarely see collapse during or at the conclusion of our operative manipulations in patients who had, at first, seemed to have sufficient strength to withstand the shock of the operation.

Simple enterostomy and drainage was once highly recommended. Treves advises against its use in all but exceptional cases. He calls it “a rough and ready operation, extreme, irrational, and blindly advised,” and declares that such evidence as we possess is in favor of the operation only in “extreme cases in which the patient can only be submitted to a procedure of the slightest magnitude.” He believes that not a few of the cases of recovery from intestinal obstruction that have been reported have been the subjects of erroneous diagnosis. He speaks very highly, however, of the establishment of an opening in the bowel after the obstruction has been found and relieved, and declares that this addition to the operation has reduced the mortality of the measure by fifty per cent.

For the reasons I have above stated, the objection of Treves, that one shall not blindly do an enterostomy for the relief of acute obstruction in any but desperate cases, seems to me too far-reaching.

It is hardly necessary to state that the operation of enterostomy is a very simple one, if necessary it can be done in a few minutes under local anæsthesia. It may be a life saving procedure in very desperate cases, of which the following was an example.

CASE I—*Acute intestinal obstruction following upon a chronic obstruction, enterostomy and drainage under local anæsthesia, ileosigmoidostomy, resection of intestine and end to end anastomosis for persistent fecal fistula, recovery*

Robert L., 45 years of age, seen with Dr. S. Basch, admitted March 7th, discharged cured May 13th, 1907. Ten years before the patient had an attack of abdominal cramps without vomiting, lasting seven days. Fifteen weeks before admission, he noticed that he had become gradually more and more constipated. About this time he had an attack of constipation with abdominal pain and nausea which lasted three days and was relieved by free catharsis. From that time until he was admitted to the hospital he had had, every few days, a similar attack, each time relieved by cathartics and enemata. He vomited during the most recent attacks. Never passed blood, never had fever, has lost 40 pounds in weight. Twenty-four hours before, he was suddenly attacked by severe cramps with vomiting, at first of food and then of feculent material, there was absolute constipation in spite of enemata and cathartics, for six hours he had vomited every few minutes, and was much exhausted.

The patient's condition, on admission, was a very poor one, his eyes were sunken and face pinched, his pulse was barely perceptible, extremities cold and clammy, he was vomiting almost continuously small amounts of intestinal contents. The abdomen was enormously distended and small intestine peristalsis was everywhere visible, on account of the enormous distention, and marked general tenderness, nothing definite could be found on palpation. Rectal examination negative. Although the condition seemed to be a hopeless one, he was nevertheless taken to the operating room.

Under Schleich anæsthesia the abdomen was opened through the fibres of the right rectus muscle (Dr. Elsberg). The intestines were much distended and of a dark blue color. One loop was pulled forward, a small opening made into it and drainage tube inserted and fixed into place by several tobacco-pouch sutures. A very large amount of fecal matter and much gas was expelled. Several other loops were incised and their contents evacuated and the openings closed by suture. The abdominal walls were closed around the tube by interrupted sutures. After the operation, which had lasted less than 15 minutes, the patient's condition improved somewhat, there was a profuse discharge of fecal matter through the tube. Twelve hours after operation the patient was much better, the pulse had become slower and of better quality, the abdomen was now soft and collapsed, the patient

had not vomited since the operation. Thereafter he made a good recovery.

Three weeks after the first operation, the abdomen was opened through the left rectus muscle and the attempt made to find the obstruction. There was a very dense mass of adhesions between the cæcum and lower coils of ileum which it was impossible to separate. An ileosigmoidostomy was then done in the usual way by suture, thus excluding the affected portion of intestine. Recovery from this operation was rapid and uneventful, and the patient began to gain flesh rapidly. The enterostomy opening could not, however, be made to close. On April 22nd the loop of small gut containing the opening was exposed and resected,—an end to end anastomosis by suture being made. Recovery from the third operation was also uneventful. The patient could be discharged cured with all of his wounds healed, free from all symptoms, and having gained more than thirty pounds, on May 13th, nine weeks after the first operation.

This patient was in a very desperate condition when admitted to the hospital. By the simple operation of enterostomy, it was possible to tide him over the acute symptoms and thus to save his life. At the second operation, when the patient was in good condition and there was no need of great haste, the adhesions around the obstructed bowel were found to be so dense that it was impossible to divide them. An ileosigmoidostomy had to be done. The patient had probably had an attack of appendicitis many years before, a search was made for the appendix at the second operation, but it could not be found.

In these desperate cases, no voice is raised against the operation of enterostomy. But in less grave cases, in patients who still seem to be in fair condition, whose circulation is still pretty good, who are not exhausted by the vomiting, the operation of opening and drainage of the bowel (without a search for the obstruction, except in the simplest cases) has few adherents. It is just in this class of cases that I believe that enterostomy should be done more often and the search for and relief of the obstruction left to a second sitting. This

is no more of an "extreme, irrational, and blindly advised" operation, than is the opening and drainage of the bladder as a preliminary to the removal of the prostate for urinary obstruction. Improved results in the operations for acute intestinal obstruction will be sure to follow an increased frequency of operations in "two stages."

Against the operation of enterostomy alone, a number of other arguments have been advanced

- 1 The cause of the obstruction remains unrelieved
- 2 There may be a gangrenous process present, or gangrene may set in unless the obstruction is relieved
- 3 After the enterostomy, a fecal fistula will remain which may require a second operation for its closure

*As to 1—*

It is true that if nothing is done but the enterostomy, the obstruction remains unrelieved, and further operative interference will in all probability be required. The dangers of an operation for obstruction when there are no acute symptoms are, however, so much less, and the technical difficulties so much smaller, that the division of the operation into two stages is justifiable.

In the presence of acute symptoms, the operation must usually be done hurriedly. As soon as the abdomen is opened, a large mass of distended intestines present. The shock from handling the bowel is a very great one. Even with the gentlest manipulations, the peritoneal covering of the bowel is apt to tear.

Very often there is no hope of finding the obstruction, unless more or less of the bowel is drawn out of the abdomen. This evisceration causes enormous shock, and the replacement of the intestines is often very difficult, even if a number of coils have been emptied by aspiration or enterostomy. It has been my experience that in the cases of acute obstruction in which it was necessary to drain the bowel as well as to relieve the obstruction, the mortality has been a very high one.

In some cases the drainage of the bowel will relieve not only the acute obstruction symptoms but also the obstruction

Thus in obstruction by bands—especially if they are of recent origin—the emptying of the distended intestine may allow the obstructed loop to slip out from under the band. Or the recent adhesion will gradually stretch while the bowel is being drained. In the same way, drainage of the distended bowel above the obstruction may allow the volvulus to untwist, the kink to straighten out, etc. In the following cases of post-operative intestinal obstruction, the opening and drainage of the bowel not only relieved the acute symptoms but was curative.

CASE II—*Acute gangrenous appendicitis, seropurulent peritonitis, appendicectomy and drainage, post-operative intestinal obstruction due to adhesions, enterostomy and drainage, recovery*

Mildred L., 9 years of age, seen with Dr. M. Bodenheimer, was admitted and operated upon for acute appendicitis with seropurulent peritonitis on August 14th, 1907. The patient made a rapid convalescence from the disease, the temperature was normal from the fourth day after operation. On the tenth day, the patient vomited and complained of abdominal pain, without temperature rise or other symptoms. The bowels, which up to that time had moved regularly, refused to move in spite of cathartics and enemata. Vomitus at first consisted of food but soon became feculent, and the patient's general condition became very poor. Eighteen hours from the first appearance of symptoms of obstruction, the abdomen was opened through the left rectus muscle, a loop of distended gut pulled into the wound, a tube inserted and the bowel drained. No attempt was made to find the obstruction on account of the poor condition of the patient. The child recovered rapidly after the operation. For the first few days there was a profuse discharge of fecal matter through the tube. After four days, the tube was clamped for 6 hours at a time, the following day the bowels moved per rectum. Three days later, the drainage-tube was removed, the opening was closed in ten days, the bowels moved regularly. The patient was discharged cured on September 21st and has remained well up to the present time.

CASE III—*Acute gangrenous appendicitis, abscess, appendicectomy and drainage, post-operative intestinal obstruction, enterostomy and drainage, recovery*



Lionel S, 11 years of age, July 9th, 1905, appendicectomy and drainage for acute appendicitis with abscess, July 19th, first symptoms of intestinal obstruction, July 20th, enterostomy and drainage through left rectus incision, July 23rd, bowels moved per rectum, July 26th, drainage-tube removed, August 28th, enterostomy wound healed and bowels moving normally Has remained well

CASE IV—*Acute gangrenous appendicitis, purulent peritonitis, appendicectomy and drainage, pneumonia with marked abdominal distention, acute intestinal obstruction, enterostomy and drainage, persistent fecal fistula, enterorrhaphy, recovery*

Samuel L, appendicectomy and drainage, August 25th, 1907, for gangrenous appendicitis with diffuse purulent peritonitis, patient very septic Double pneumonia of septic type lasting five days after operation One week later, acute obstruction, marked distention, vomiting of large quantities of fecal matter, enterostomy and drainage, normal bowel movement on fourth day after operation, tube removed on ninth day, fecal fistula persisted November 25th, edges of intestine freed and turned in with double row of sutures Discharged cured December 19th

The clinical picture, in the three patients, was a typical one of post-operative ileus All three patients were relieved, not temporarily but permanently, of their obstructive symptoms by drainage of the bowel

In these very recent cases of post-operative obstruction, it is preferable to open the abdomen a little distance away from the site of the first incision, because the intestines in the neighborhood of the former lesion are usually bound to each other by numerous fresh adhesions, which would require extended manipulations for their division If the obstruction occurs months or years after the operation, it is advisable to open the abdomen through the original incision, as the probability of finding a single band or adhesion is much greater

In general, it is advisable to open the abdomen directly over the obstructed bowel, if it is possible to locate the site of the obstruction By a careful examination, the location of the obstruction can be determined with a fair amount of accuracy

in a large number of cases. One can then follow a methodical plan,—relief of the obstruction if found at once and remedied with ease, otherwise opening and drainage of the most distended loop.

In the following cases this plan was followed. In each patient the incision was made over the suspected area, in every one of the cases, the cause of the obstruction was at once found and relieved, although the operator was prepared to do no more than an enterostomy.

*CASE V—Acute intestinal obstruction due to a band, two and one-half months after operation for acute appendicitis, laparotomy and division of band, recovery*

Leo S., 14 years old. Seen with Dr J Reinthaler. Was attacked three days before with cramp-like pain in abdomen, abdominal distention, vomiting and constipation. The symptoms became gradually worse and the vomiting more frequent, there was absolute constipation. On admission, the abdomen was distended and rigid, there was some movable dullness in the flanks, marked hyperperistalsis. Operation May 16th, 1906, a few hours after admission (Dr Elsberg). The abdomen was opened through the old scar, the peritoneal cavity contained clear fluid. Just underneath the abdominal incision was found a band of adhesions constricting two loops of ileum. This was divided between ligatures and the abdomen closed by layer sutures. The patient's bowels moved spontaneously a few hours after operation. Convalescence was uneventful. Discharged cured, May 28th, 1906.

*CASE VI—Acute ileocolic intussusception, laparotomy and reduction, four weeks later, acute obstruction due to band, laparotomy and division of band. Five weeks later acute obstruction due to band, laparotomy and division of band, recovery*

Irwin F., six months old, seen with Dr D E Alexander, admitted April 30th, 1906. Three days history of abdominal pain, vomiting, constipation. Abdomen distended, hyperperistalsis, small soft mass in right iliac region. General condition fair. April 30th, laparotomy and reduction of ileocolic intussusception, apex of intussusception reduced with difficulty. Uncomplicated recovery.

Four weeks later the infant suddenly developed symptoms

of acute obstruction of the bowels,—vomiting, constipation, abdominal distention. The bowels refused to move in spite of enemata, and the child's condition became rapidly worse. May 24th, second operation, incision through old cicatrix in median line below umbilicus. The abdomen contained free fluid. The cæcum was at once seen constricted by two bands which ran over it, from the ileum. Division of bands was easily accomplished, and the abdomen was closed. The bowels moved spontaneously twenty-four hours later, thereafter convalescence was uneventful.

Six weeks later the child again developed very severe symptoms of acute obstruction. Eight hours from the beginning of the symptoms, the abdomen was opened a third time, through the old scar. The small intestines were enormously distended. A band was at once found which ran from the cæcum to the lower ileum and caused an obstruction of the ileum. The band was divided, the raw surface covered with peritoneum, and the abdomen closed without drainage. Recovery from the third operation was prompt and uneventful. The bowels moved on the day after operation. The patient was discharged cured on the ninth day after operation, and has remained well since.

CASE VII—*Acute intestinal obstruction due to a band from adhesions after operation for appendicitis four years before, laparotomy and division of band, recovery*

Aaron S., 14 years old, seen with Dr. T. I. Jacobus, admitted November 13th, discharged November 22nd, 1906. Operated on in another hospital for acute appendicitis four years before. Three days history of abdominal cramps and vomiting. Bowels have not moved for four days. General condition good, abdomen much distended, free fluid, hyperperistalsis. Operation November 13th (Dr. Elsberg) abdomen opened through old scar. As soon as the peritoneum was incised, a collapsed loop of small intestine was seen fixed to the posterior abdominal wall by a band, with distended bowel beyond it. Division of band, closure of abdomen in usual manner. Convalescence uneventful. Bowels moved twelve hours after operation, vomiting ceased at once. Has remained well.

CASE VIII—*Acute gangrenous appendicitis, seropurulent peritonitis, appendicectomy and drainage, pelvic abscess, incision and drainage per rectum, acute intestinal obstruction due to band, laparotomy and division of band, recovery*

Morris G, fourteen, was admitted and operated upon (Dr Elsberg) March 7th, 1907, for gangrenous appendicitis with abscess and diffuse peritonitis. The appendix was removed and the abscess drained. Two weeks later a pelvic abscess was opened and drained through the rectum. Two weeks after this, when the patient was out of bed, he was suddenly attacked by severe cramps in the left lower abdomen with vomiting. The cramps became more severe and the vomiting more frequent. In the lower abdomen was felt a large distended loop of bowel. No fever or other symptoms. Patient passed neither flatus nor feces for twenty-four hours in spite of high and low enemata. Fourteen hours from the beginning of the symptoms, the abdomen was opened through the fibres of the left rectus muscle over the distended coil of intestine. Part of the ileum was found adherent to the left side of the pelvis by a band which kinked and obstructed the intestine. When the adhesion was divided, gas passed from distended to collapsed gut. The abdomen was closed with drainage. The vomiting ceased at once, an enema given soon after the operation was effectual, convalescence thereafter uneventful. Discharged cured, April 28th, seven weeks after the first operation.

CASE IX—*Volvulus of sigmoid flexure due to congenital megacolon, laparotomy and reduction, enterostomy and suture, recovery*

Annie G, 20 years of age, admitted November 19th, 1907, with a history of no movement of the bowels for five days, vomiting, abdominal distention. The patient declared that she had always been very constipated since childhood, that for the last six months her bowels never moved unless she took a cathartic. On admission, the patient's general condition was a very good one, the abdomen was enormously distended, there was marked hyperperistalsis, a large distended coil of intestine could be seen bulging the lower part of the abdomen.

The abdomen was opened through a median incision below the umbilicus (Dr Elsberg). At once an enormously distended, hypertrophied sigmoid flexure twisted upon itself for 180° presented in the wound. The loop was withdrawn from the abdomen and untwisted. It was so large that it could not be replaced until it had been emptied of gas and feces by an incision. The incision was closed, the bowel returned into the abdomen and the

abdominal wall closed with drainage. The bowels moved four days later. Convalescence was interrupted by a slight wound infection. She is at the present time almost entirely recovered.

In the five preceding cases, the cause of the obstruction was found and remedied with ease, so that enterostomy was unnecessary. The case of the infant who had an ileocolic intussusception, followed by two attacks of acute obstruction due to bands, is especially noteworthy. In all of these patients, no search had to be made for the cause of the obstruction, it was found at once as soon as the abdomen was opened. Therefore the operation could each time be done rapidly with little handling of the intestine. The conditions were different, however, in the following two patients, in both cases I had planned to do nothing but an enterostomy, in both the discovery of the cause of the obstruction, and its relief were easier than was anticipated. In the one case, the extraction of a gallstone from the ileum was accomplished with ease, in the second case, the division of bands in the hernial sac could be done outside of the abdomen, with little handling of the intestine, and hence with little shock.

*CASE X—Acute intestinal obstruction due to adhesions in a hernial sac, herniotomy, division of adhesions, reduction of intestines, recovery*

H. R., male, 55 years of age, admitted November 27th, discharged December 13th, 1907. Reducible hernia for ten years. Four days ago the hernia became irreducible, bowels became obstinately constipated, vomiting became frequent. On admission there was a large irreducible inguinal hernia on the left side. The hernial sac was opened through a four-inch incision (Dr. Elsberg). There was a large mass of small intestine in the hernial sac, several loops of which were bound to each other and to the walls of the sac by several firm adhesions. After these had been divided, the intestines were reduced with ease. The neck of the sac was very large. The peritoneum was then closed by a running suture at the base of the sac. Convalescence was rapid and uneventful. The patient was given a truss, no radical opera-

tion was attempted. The bowels moved twelve hours after operation, and regularly thereafter.

The patient's general condition on admission was a good one, although the vomiting was feculent in character.

CASE XI—*Acute intestinal obstruction due to gall-stone occluding the upper ileum, enterotomy and extraction of calculus, recovery*

Mrs. B, 62 years of age, seen with Dr. S. Neuhof, admitted April 28th, discharged June 27th, 1906. Gave a history of frequent attacks of abdominal pain for many years. Never was jaundiced. Four days before admission she suddenly complained of severe abdominal cramps, vomited, and had slight fever. For two days she vomited everything taken into the stomach, but the bowels moved with enemata. Thereafter she passed neither flatus nor feces, the vomiting continued and became more frequent, for the last six hours it was distinctly fecal. The abdomen became distended and everywhere tender. The patient was a very stout lady, her condition was poor, the pulse rapid and weak, she was much prostrated. Every few minutes, a distended rigid coil of intestine was to be felt to the right and above the navel. No tumor palpable, rectal examination negative, no jaundice.

As soon as the patient could be transferred to the hospital, the abdomen was opened by an incision to the right and at the level of the umbilicus, over the distended intestine (Dr. Elsberg). The distended loop was drawn up into the wound in order to open and drain it. At once a tumor was felt in this loop which proved to be a large calculus occluding the bowel. The intestine was incised, the calculus extracted, and the incision closed with a double row of Lembert sutures. The abdomen was rapidly closed with drainage.

The patient was considerably shocked by the operation but recovered after energetic stimulation. The vomiting persisted for 24 hours and then ceased. After a very complicated and slow convalescence the patient was discharged cured on June 27th, 1906.

Even in those cases in which the obstruction can be found and relieved with ease, it is often preferable at the first operation to do nothing more than drain the intestine. Had I done this in the following case, the operation would have taken less time and the unfortunate outcome might have been prevented.

The patient's condition was a poor one, the intussusception lay directly under the abdominal opening, its reduction was accomplished with ease, nevertheless the handling of the bowel must have added much to the existing shock. In the future, in a similar case, I should do nothing more than an enterostomy, no matter how great the temptation to reduce the intussusception.

CASE XII — *Acute ileocolic intussusception, laparotomy and reduction, death*

Bella P., 7 months of age, admitted and died March 12th, 1907. Three days history of constipation with vomiting. Vomiting fecal on the day before admission. General condition very poor, pulse hardly perceptible. Abdomen distended, hyperperistalsis, in right lower abdomen doughy mass to be felt. Incision over mass through right rectus fibres. Abdomen filled with clear fluid. Intussusception found at once drawn into wound, reduction easily accomplished. About 12 inches of ileum invaginated. Abdomen rapidly closed. Operation lasted 11 minutes. Condition of patient did not improve, death occurred a few hours after operation.

2 It has been advanced as an argument against the operation of enterostomy in acute obstruction of the bowels, that if the obstruction is not looked for, gangrenous intestine may be left in the abdomen, or unless the constriction is relieved a constricted part of the bowel may become gangrenous. The frequency of gangrene is not, however, as great as is commonly believed. I have carefully studied the records of Mt Sinai Hospital, of other institutions, and the reports in the literature of the subject.

During the last four years, 54 patients with acute intestinal obstruction were operated upon at Mt Sinai Hospital. In 7 of these cases, or 13 per cent, gangrenous intestine was found at the operation or autopsy (intussusception, 4 cases; volvulus, 2 cases, Meckel's diverticulum, 1 case). Philipowicz has recently reported 80 cases of ileus, in 16 (20 per cent) of which gangrenous gut was found at operation (volvulus,

11 cases, intussusception, 1 case, Meckel's diverticulum, 2 cases, bands, 2 cases) There was gangrene in 5 of Ranzi's 35 cases (14 per cent), (volvulus, 1 case, bands, 2 cases, tumors, 2 cases) If the above figures be added together we have 28 cases of gangrene, 19 or 70 per cent of these were cases of volvulus or intussusception Gangrene of the intestine is present therefore only in about 15 per cent of cases of acute intestinal obstruction, and 70 per cent of the patients with gangrene have either a volvulus or an intussusception In these latter cases, the cause of the obstruction is usually found with ease, and the gangrenous intestine can therefore quickly be brought outside of the abdomen to be dealt with at a later operation Excluding intussusception and volvulus, gangrene occurs in about 5 per cent of patients with acute obstruction The risk of leaving behind gangrenous gut by the performance of enterostomy alone is therefore a small one

There is no doubt that, in many cases, the drainage of the distended gut will have a beneficial effect upon a constricted or obstructed loop of gut, and may prevent a threatened gangrene If gangrenous gut is found at the operation, it is preferable to bring it outside the wound and anchor it there by a few sutures At any time after the patient has recovered somewhat from his obstructive symptoms, the gangrenous bowel can be excised

If this plan had been adopted in the following case, the patient would have stood a better chance of recovery

CASE XIII—*Volvulus of intestine due to gangrenous Meckel's diverticulum, excision of diverticulum, enterostomy, death*

Morris E., aged 20, was admitted to the hospital on February 20, 1906, with a history that for three days he had abdominal pain with vomiting and constipation The vomiting had not been very frequent but the pain had been constant and increasing Bowels had not moved since onset of illness The patient's general condition was fair, the abdomen was distended and rigid, the entire lower part of the abdomen was tender, there was only slight fever, the pulse was of good quality and not rapid An



enema was given soon after the patient entered the ward, and the bowels moved freely. The pain also became less but the abdominal distention persisted. His condition steadily improved until the fourth day. Then the abdominal pain returned and became very severe, the patient began to vomit again, the bowels refused to move. Within an hour his condition became poor, the vomiting grew more frequent, the pulse became rapid and feeble.

He was taken to the operating-room at once and the abdomen rapidly opened by an incision through the right rectus muscle (Dr. Elsberg). The small intestines were much distended. One distended coil was withdrawn from the abdomen, and immediately beneath it was found a small piece of gangrenous gut, which proved to be a Meckel's diverticulum adherent to a loop of lower ileum in such a way that the latter was twisted upon itself for 360°. The diverticulum was freed from its adhesions and tied off at its base and removed, the loop of gut untwisted, and the abdomen rapidly closed with drainage.

The patient was in very poor condition at the close of the operation and his condition remained poor. Twelve hours later the abdomen was again opened through the former incision, a distended loop of intestine pulled forward, opened and drained in the usual manner. The enterostomy did not, however, prevent the fatal outcome, which occurred about 12 hours later.

There is no doubt in my mind that the correct procedure in this case would have been to have brought the gangrenous diverticulum outside of the abdomen and to have established an enterostomy above it. This could have been done in one-half or one-third of the time and would have entailed much less handling of the intestines.

3. Another objection that has been urged against the opening and drainage of the bowel in all but desperate cases, is that a fecal fistula will remain, which may require a dangerous operation for its closure. If the enterostomy is properly done, a fistula will remain in only a small proportion of the patients. The best method for the performance of an enterostomy is that which embodies the principle of the Kader gastrostomy. Two circular sutures are placed in the wall of

the bowel to be opened, a small incision is then made, a catheter inserted, the catheter fixed in the wall of the bowel by a silk stitch, and the two circular sutures then tied. The inner of the sutures is tied first, the catheter being pushed into the bowel. In this manner a canal lined by serous membrane is formed which will close rapidly as soon as the catheter is withdrawn.

The bowel is then attached to the peritoneum along the margins of the abdominal wound by one or two sutures, and the abdominal wound closed around the tube. If the patient's condition is very poor, the small incision in the abdominal wall can be packed with gauze. The tube from the intestine is led over the side of the patient's bed into a bottle or receptacle. There is no leakage by the side of the tube, the dressings remain clean. When the tube is withdrawn the opening in the bowel closes very rapidly.

If the drainage of the bowel is done in the manner above described, and if the obstruction has been relieved, a fecal fistula will remain in only a small proportion of the patients. A persistent fistula can be closed by a lateral enterorrhaphy. Sometimes, however, an intestinal resection will be required.

There is one danger after enterostomy which merits careful consideration. If the obstruction is located in the jejunum, the opening and drainage of the bowel may result in very rapid starvation. Obstruction of the jejunum forms, however, only a small percentage of the cases and the clinical recognition of these cases is often possible. If the enterostomy has been made high up in the small intestine, the delay before the second operation must be a short one—24 to 48 hours.

The cases above reported, 13 in number, represent all the cases of acute obstruction of the bowels, exclusive of strangulated hernia, that have been operated upon by the writer during the past two years on the Second Surgical Service at Mt. Sinai Hospital, and in private practice. The writer deems the following the best working plan for the operative treatment of acute obstruction of the bowels.

A—*The patients in good condition*—here a more or less prolonged search for the obstruction is allowable

B—*The patients in very poor condition*—opening and drainage of the most distended loop of intestine. The incision in the abdomen should be, if possible, over the site of the obstruction, it should be as small as possible. The bowel should be drained by a catheter, fixed in the bowel according to the method of Kader, and the bowel should be fixed to the parietal peritoneum by one or two stitches

C—*The patients in fair condition*—relief of the obstruction if the same be found at once when the abdomen is opened, and if the relief can be accomplished without complicated manipulations. In all other cases, opening and drainage of the bowel, perhaps with fixation of affected loop of intestine in the wound or outside of the abdomen. Relief of the obstruction at a second operation

### CONCLUSIONS

1 Operative interference for acute intestinal obstruction should very often be divided into two stages

2 Enterostomy and drainage should be the operation of choice, not only in the desperate cases, but also in many patients whose condition is still a fair one

3 Prolonged search for the obstruction and its relief should, in all patients excepting those in very good condition, be delayed until the acute symptoms have been relieved by the opening and drainage of the bowel

4 The danger of leaving behind gangrenous intestines is a small one, it is smaller than the danger from prolonged manipulations

5 When gangrenous intestine is present it is preferable to bring it outside of the abdomen and deal with it later, the obstructive symptoms being meanwhile relieved by enterostomy

6 Enterostomy, thus done, is not an "extreme, irrational and blindly advised" operation, but one that embodies a dis-

tinct therapeutic principle,—alleviation of acute symptoms as the first step in the relief of a pathological condition

7 The operation of enterostomy may permanently relieve acute intestinal obstruction

8 Fecal fistulæ will remain in only a small proportion of the cases in which enterostomy has been done, if the opening and drainage is made according to the Kader principle

# THE NON-ABSORBABLE SUTURE AND LIGATURE \*

BY OSCAR H ALLIS, M D ,

OF PHILADELPHIA,

Surgeon to the Presbyterian Hospital

THERE are few subjects that have occupied the surgical mind more than that of suture material. Animal suture material has the disadvantage that when moist it is difficult to tie, when fine it has little tensile strength, and when coarse it is not suited to fine plastic work. Silk on the contrary is the easier handled when wet, makes all the firmer knots from moisture, possesses adequate strength in its finest sizes for the work for which it may be selected, and when rendered sterile satisfies most of the requisites for suturing material.

In the class of surgery that permits of immediate closure of the initial wound, primary union and return to soundness always gives rise to the question, What becomes of the silk suture or ligature? In amputations bleeding vessels are surrounded by different structures than when operations are performed in serous cavities, yet in both instances the sterile suture or ligature is probably immediately enveloped in exudate which is later organized and becomes a part of the economy. If the suture material is fine, it may never give rise to any irritation, but if large, and of sufficient strength to ligate an ovarian pedicle, the ligature may finally come away.

But in the class of surgery—especially abdominal surgery—in which it is not feasible to close the initial wound, pus cases, or cases where drainage is indicated, the fate of the non-absorbable suture or ligature is not a matter of doubt. The suture about an appendix, the stump of a pedicle, or the peripheral suture in a plastic operation of the intestine, is liable to infection, and healing will be retarded until the suture comes away. It is hard to explain why in so many cases of necrosed appendices the sinus leading to the part will be two, three, four, or more months in closing and

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\* Read before the Philadelphia Academy of Surgery, February 3, 1908

finally without any assignable cause will heal, unless it can be explained by the presence of infected ligature that has finally been ejected

No part of the operation for the removal of the appendix has given rise to more discussion than the treatment of the stump. The usual way of ligating with silk and dropping the bowel back, while it often answers perfectly well in clean cases, is, it seems to me, open to objection in the gangrenous ones. The earlier surgeons in amputations always brought the ends of the ligatures out of the wound, and such it seems to me would be good routine surgery in ligations in infected areas.

In anastomoses of the intestines, whether the Murphy button be used or suture, it is the practice of many surgeons to put a fine running stitch around the serous border of the approximated structures. If such a case could be insured against infection this peripheral suture would do no harm, but if infection is unavoidable and drainage necessitated, then this peripheral suture may become a permanent annoyance and be the cause of an intractable sinus.

In a case of gangrene of the intestine following a neglected umbilical hernia, after resection of about five inches of intestine and approximation with the Murphy button I employed a fine silk peripheral suture.

On the tenth day I was surprised to see a large accumulation of fecal matter at the opening of the wound. My fears that the button had escaped at its point of insertion into the abdominal cavity led me to probe for it, but as the patient presented no untoward symptoms I concluded that the rent in the bowel had been made as the button became detached and that only a small rent had occurred. The fecal discharge continued for only a few days but a sinus remained for several weeks, which I attributed to the infected peripheral suture. I therefore took a piece of wire upon which I had made a hook like a crochet needle and passed it down to the bottom of the sinus, and had the satisfaction of catching a loop in the suture. This I seized with a pair of forceps and after

dividing it upon one side of the forceps drew out a single piece quite two inches long

Such an experience would lead one to adopt some other means of suturing the border of an approximated bowel than entirely surrounding it, or suggest the propriety of bringing the ends of the suture out of the initial wound

## REPORT OF SATURDAY SURGICAL CLINICS FOR STUDENTS,

HELD AT THE GERMAN HOSPITAL OF PHILADELPHIA, 1906 AND 1907 \*

BY JOHN B. DEEVER, M.D.,  
OF PHILADELPHIA,  
Surgeon in Chief

DURING the 26 clinics there were 193 patients operated upon with a total of 261 operations. Upon 113 of these patients 181 operations were performed.

There were 55 cases of appendicitis, of which 25 were acute. Of the patients with acute appendicitis, there were 18 males and 7 females. The appendix was found acutely diseased and removed in 2 patients operated for other conditions: one a male with inguinal hernia, the other a female with prolapse of the uterus.

Of these 25 cases, 12 had abscess. The average duration of the attack in the non-abscess was 5 days, and in the abscess cases 3.6 days. Six of the non-abscess cases were operated in their first attack, and in 9 of the abscess cases the history of a previous attack was not elicited.

The incision varied according to the pre-operative findings. Of these acute cases, in 9 the McBurney or gridiron incision was made, in 3 the incision was made through, and in 9 at the outer border of the right rectus muscle.

In 4 cases the incision was made above and parallel with the outer third of Poupart's ligament and carried well up into the loin space, making the operation in greater part extraperitoneal. When I can do this operation I much prefer it, as the less intraperitoneal interference, particularly when infection is present, the better for the patient.

The appendix was subcæcal in 4 cases, to the outer side of the cæcum in 1 case, to the inner side in 4, and in 4 cases

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\* Read before the Philadelphia Academy of Surgery, February 3, 1908



in the pelvis In 2 cases the pathological conditions were so severe as not to warrant searching for the appendix (In the remaining 10 cases the position of the appendix was not noted) The appendix was gangrenous and perforated in 4 cases, gangrenous in 4, and in 2 of these had ulcerated off near the base, while in the remaining 17 the appendix was either adherent, congested, swollen, or covered with inflammatory exudate

The technic in removing the appendix varied with the pathological condition of the organ In 12 of the acute cases, ligation with catgut and cauterization of the stump was done In 5 cases the stump of the appendix was invaginated, and held in this position by a purse-string suture of linen thread in 3 cases simple ligation with linen thread covering the stump with the adjacent serous coat of the cæcum In 4 cases the appendix was ligated with silk, and the stump cauterized, in one the appendix was amputated flush with the cæcum, and the opening in the cæcum closed by two interrupted Lembert sutures of linen thread

Drainage was introduced in 16 of the 25 acute cases and consisted of gauze, with or without a rubber or glass drainage-tube In 8 cases a glass tube was placed in the pelvis In abscess cavities, one or more pieces of gauze were used, multiple wicks frequently being required to drain the ramifications of the cavities Rubber tubes were used when there was much to drain, cigarette wicks in a few cases in which there was little to drain In the 9 undrained cases the wound was closed with tier sutures of chromicized catgut

Leucocyte counts were made in all these acute cases except six Of the non-abscess cases, a count of 8000 prevailed in 2 cases, of 9000 in 1, of 11,000 in 2, of 15,000 in 1, and of 16,000 in 1 Of the cases with abscess, there were 7000 in 1, 10,000 in 2, 11,000 in 2, 14,000 in 1, 15,000 in 1, 17,000 in 1, 18,000 in 1, 20,000 in 1, and 22,000 in 2 Thus of the non-abscess cases in which counts were made, in 5 the count was below 15,000, whilst in 2 only, the count was 15,000 or more

But of the 12 cases with abscess, in 6 the count was below 15,000, and in 6, 15,000 or more There were two patients, both of whom had been sick equally long before operation (10 days), and in whom the leucocyte count was equal (15,000) One, who had a previous attack one month before, showed an

acute ulcerative appendicitis, with adhesions between the cæcum and appendix, and the posterior parietal peritoneum, the other revealed foul greenish pus at operation. Thus, while in the majority of cases a high leucocyte count is strongly suggestive of pus, yet, as we have just illustrated, cases can be selected which exhibit an equal count, but in which the findings at operation are entirely different. It is this very fallibility which compels the operator to give more weight to the clinical examination, and less to that of the laboratory. We found that differential leucocyte counts were of no more significance in determining the presence of pus than the leucocyte counts alone. The differential count is of moment in judging of the patient's resistance.

Microscopic examination in 18 of the appendices showed that the disease was interstitial in 5, ulcerative in 7, and chronic, with acute exacerbations in 6. Of this last group, namely, those six in which the microscope revealed chronic appendicitis with acute exacerbations, one gave a history of a previous attack, and exhibited adhesions at the operation, one gave no history of previous attacks, but exhibited adhesions at the operation, whilst the remaining 4 gave no history of previous attacks, and had no adhesions.

The fact that in four of these six cases the clinical history,—provided, of course, that it is correct and the patient's memory was not faulty,—and the operative findings did not support the laboratory diagnosis of chronic appendicitis with acute exacerbations, shows either that the microscopical diagnosis, as in cancer, is subject to error, or else that, as occurs in the gall-bladder, there may be latent or masked infections of the appendix which, while causing the patient little or no discomfort,—or at least not enough to impress his memory,—yet leave their marks in the organ, to be revealed only by the microscope.

The *Bacillus coli* was recovered in cultures taken from the appendix or the abscess in 5 cases.

I desire to call attention to the immediate or remote effects of appendiceal pus. Last year in reporting my Saturday Clinics I referred to the frequency of toxic nephritis in cases of acute appendicitis with abscess, as revealed by examination of the urine previous to operation, and I mentioned its subsidence, usually within a few days after operation. Now I shall speak of some of the post-operative effects of pus. Individually I

might refer to one of the cases whose peritoneal cavity harbored much pus. The patient was 55 years of age, and had been sick eight days. Operation, by lateral incision, carried above and parallel with upper third of Poupart's ligament and into the loin, revealed the peritoneum acutely hypertrophied, the appendix lying mesial to the cæcum, pointing towards the umbilicus, and partly gangrenous and perforated. Pus was found near the liver,—presumably on its way to form a subdiaphragmatic abscess, running over towards the umbilicus, along the appendix, and in the appendix in large quantity. A gauze strip was placed in each of these directions, and a glass tube in the pelvis. While I do not sanction drainage by multiple wicks in acute diffuse peritonitis, yet when the pus is present in definite multiple collections, the latter should be reached, if at all possible, and freely drained, so as to avoid the disastrous and so-called secondary collections, by evacuating them when they are primary collections. Six days after operation, a fecal fistula, at the site of the gangrenous area around the base of the appendix, occurred. After another month, the fistula not having closed, a second operation showed numerous adhesions between the visceral peritoneum of the cæcum and omentum and the parietal peritoneum. These adhesions proved that the drainage had been effectual, and that the omentum had prevented dangerous peritonitis, by exercising its function of throwing out large quantities of exudate about the site of infection. The adhesions were divided, and the fistulous tract obliterated by inverting with a broad base the offending stump of the appendix.

One patient developed, one month after operation, an abscess low down in the pelvis about the rectum. At the first operation no pus was found, but there were adhesions between the visceral peritoneum of the cæcum and the appendix, and the parietal peritoneum of the posterior abdominal wall. There was no note made in this case as to whether or not the pelvis was explored at the time of the first operation, therefore, I cannot say definitely if there was at that time a small collection which had been overlooked, or whether subsequent abscess formation was consequent upon the extension of infection.

Another patient, from whom four ounces of thick, foul pus had been evacuated, developed, shortly after operation, suppurative parotitis, and tonsillitis.

One patient had infection by contiguity of the right Fallopian tube, necessitating removal of the tube

Pelvic appendicitis in the female I believe to be a not uncommon cause of sterility, therefore one of the many arguments in favor of early operation,—operation if possible before the infection has travelled beyond the confines of this organ

Three deaths occurred in this series, one in a patient who, one week after operation, developed acute intestinal obstruction. Operation for the relief of the obstruction revealed two areas of gangrene in the lower part of the ileum, which formed part of the abscess wall. One area was three inches long and involved half the circumference of the bowel, the other area situated four inches higher, was still more extensive. Resection of the bowel was necessitated.

The second death occurred in a patient 53 years old who had been sick five days before admission and operation. The abdomen was greatly distended and universally tender, showing diffuse infection of the peritoneum. Operation revealed quantities of thick, foul, yellowish pus, and the appendix free in an abscess, it having separated at its base by ulceration. This was an example of the fulminating type of this disease.

The third death occurred in a patient who had been sick for forty-eight hours before admission and operation. Examination revealed general board-like rigidity, with tenderness. Incision gave exit to a large amount of free pus from the general peritoneal cavity as well as from the pelvis. The appendix, subcæcal, was perforated at the base close to the cæcum,—a second example of the fulminating type. Two subsequent operations were performed to establish free drainage, in the attempt to drain the peritoneal cavity. Postmortem revealed diffuse purulent peritonitis, a large collection of pus between the right lobe of the liver and the abdominal wall, another about the spleen, and perforation of the right cupola of the diaphragm, with bilateral bronchopneumonia.

Of the 30 cases of chronic appendicitis, 17 were in males and 13 in females. The longest appendiceal history was 18 years, the shortest two weeks.

Of the 20 cases in which the number of attacks was definitely stated 10 had one, 6 had two, 3 had three, and one had six attacks. In these cases the time that elapsed since the last

attack varied from two to five months. The patient (a cornice-worker) who had the greatest number of attacks, had his first one year before operation. He had suffered from constipation during the entire time of his appendiceal history. This latter patient was operated upon six months previously and an appendiceal abscess was evacuated. For sixteen days following this operation the patient was very ill. Two months after discharge from the hospital a fecal fistula developed, which discharged for a period of two months and then closed. Since then the fistula has opened and closed several times.

Two days before re-admission for operation for the correction of the fistula, the fistula re-opened. Operation revealed numerous adhesions, in addition to a hole on the outer and back part of the cæcum, which was surrounded by necrotic, inflammatory material. The fistulous tract, and the diseased appendiceal stump were excised, and the rent in the cæcum closed.

The symptoms complained of were, in 6 cases, sudden, diffuse abdominal cramp, followed by nausea and vomiting, and localizing within a few hours to the right iliac fossa. In 16 cases the symptoms varied. In 10 the pain began in the right iliac fossa, and was variously described as severe or violent, sharp, shooting, cutting or stabbing, or dull, heavy or aching, in some of these the pain spread throughout the abdomen, like that of cholera morbus. Six patients complained of constant or intermittent, dull, aching soreness in the right iliac fossa. In the remaining 3 the symptoms were not noted. In 11 cases constipation was a marked feature.

In 22 of the cases, tenderness over McBurney's point was a constant objective sign. Rigidity, but only moderate, was present. The McBurney incision was used in 18 cases, and the short rectus incision in seven. The purse-string suture was employed in 14 cases, after clamping and removal of the appendix, and invagination of the appendiceal stump.

In 4 cases the appendix was ligated with silk or linen thread, the mucous membrane excised from the stump, the latter cauterized chemically, and covered by the adjoining serosa of the cæcum, in 7 cases the organ was simply ligated with silk. The abdominal layers were approximated with tier sutures of chromicized catgut.

*Cholelithiasis* — There were 10 cases of cholelithiasis, 3 in

males and 7 in females. The youngest patient was 29, and the oldest 46 years of age.<sup>1</sup>

A history of a definite infection, preceding the onset of gall-bladder disease was obtained in 5 cases, in all of which the infection was enteric fever. This disease preceded manifestations of gall-bladder symptoms by a few months, one year, six years, 25 years and 26 years respectively.

The lowest number of attacks was three, those in the remaining cases being designated as numerous. All of the cases had pain and this symptom was described in 4 cases as colic or cramp in the region of the gall-bladder; in 2 cases the pain was noted as severe only, and in the remaining 4, the character of the pain was not mentioned. In all the cases the pain was in the gall-bladder area, in 4 it was referred, in addition, to the epigastrium, and in 4 to the inferior angle of the right scapula. The pain was followed by nausea and vomiting in all of the cases except one, and of these cases a history of chills was elicited in 3.

Various digestive disorders, such as loss of appetite, gastric tympanites, indigestion, catarrhal gastritis, hyperchlorhydria in the shape of heartburn, eructations of sour fluid and constipation were complained of. Jaundice was present at some or other times in 5 cases.

Physical examination revealed tenderness at the site of the gall-bladder in all of the cases, rigidity of the supraumbilical portion of the right rectus muscle in 4, and palpable liver margin in 3.

Calculi were present in the gall-bladder alone in 3 cases, in the gall-bladder and cystic duct in 2, in the gall-bladder, hepatic, cystic and common ducts in 1, in the gall-bladder and common duct in 1, and in the common duct alone, in 1. The walls of the gall-bladder were thickened in 4 cases, the gall-bladder en-

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\* The analysis of these, as well as of the cases to follow, is presented with the understanding that an undeterminable amount of error is apt to be present, owing to the unavoidability of having to accept the diagnosis of previous illnesses, and description of symptoms entirely from the patient's memory. It is well known that the lay diagnosis is often incorrect, and also that the human memory is very untrustworthy, and apt to respond too quickly at the expense of truth, to the stimulus of the prodding questions of the enthusiastic examiner.

larged in 3, contracted in one, and impacted with calculi in another. Bile was absent in the contracted gall-bladder, profuse in one of the enlarged organs, tarry in another bladder, and darker than usual in 2. Adhesions present in 5 cases, were described as pericystic in 2, between the omentum and gall-bladder in 2, and between the omentum, transverse colon, duodenum and gall-bladder in one. The bile was examined bacteriologically in 6 cases, of which in 3 it was sterile, in 2 the *Bacillus coli*, and in one the *Bacillus typhosus* was present.

In 3 cases the gall-bladder was so badly diseased as to necessitate removal. Drainage in these 3 cases of cholecystectomy consisted in one of a piece of gauze to the fossa of the gall-bladder, in one of a piece of gauze in the sub-hepatic space, and a cigarette drain, cleft, with one end above the lesser omentum and the other in the foramen of Winslow, and, in one of a rubber tube in the hepatic duct supplemented by a cigarette drain. In the remaining cases a rubber tube was placed in the gall-bladder in one, in the gall-bladder and the cystic duct in 2 cases, and in the gall-bladder and common duct in 2 cases. A small counter-opening for the emergence of the drainage, was made in 5 cases, in order to allow the laparotomy wound to heal *per primum*, and thus minimize the risks of incisional hernia.

It is my practice when removing the gall-bladder in the presence of infection to drain the stump of the cystic duct when this is feasible, and if not the stump of the cystic, the common duct.

In one case, the appendix, the seat of chronic inflammation was removed at the same sitting.

The most interesting and instructive case was that of a woman, aged 31, who had had enteric fever seven years previous to operation and from whose gall-bladder the *Bacillus typhosus* was cultivated. She recalled having pain in the gall-bladder during her attack of fever (probably typhoid cholecystitis). Nine months previous to operation, that is, over six years after the attack of enteric fever, her gall-bladder disease from being latent, became active, and at this time she had her first attack. In addition to three attacks, each of which was characterized by severe colicky pain in the right hypochondrium, which radiated to the right scapula, and which was followed by nausea and

vomiting, she had, as other salient features of the disease, loss of appetite, constipation, and profuse sweats on exertion. The latest, or third attack, preceded the operation by two weeks. That these clinical symptoms are explained by the pathological findings, is quite true. There were numerous adhesions between the omentum, transverse colon and duodenum on the one hand, and the gall-bladder on the other. The gall-bladder was contracted, empty and thickened. The bile-ducts were thickened and surrounded by adhesions, and the hepatic and common ducts were greatly dilated. There was a calculus at the distal end of the common duct.

The death occurred in a female aged 29, who succumbed to shock twenty-two hours after the operation. This patient had an endocarditis which was undoubtedly caused by the toxæmia of the gall-stone disease.

*Cholecystitis*—In addition to the cases of chronic cholecystitis associated with the 8 cases of cholelithiasis, there were 2 instances of cholecystitis, one of which was subacute and the other chronic, both in females.

The subacute cholecystitis was present in a woman aged 46, who four years previously suffered an attack of pneumonia. The duration of the previous gall-bladder history was not mentioned, if, indeed there was any. However, while in the hospital, the attack occurred, upon which the diagnosis was based. The pain started in the gall-bladder region, radiated to the umbilicus, and back to the gall-bladder. Coincident with the pain were regional tenderness, and rigidity of the supra-umbilical portion of the right rectus muscle. Furthermore, there was distinct, though slight, jaundice. The duration of the attack was three and a half hours.

Abdominal section revealed a gall-bladder the size of a hen's egg, the serous covering of which was opaque, the musculature friable and thick, and the mucosa swollen, and granular. Two ounces of dark reddish-brown bile were removed. Adhesions were present several, soft and recent between the omentum and colon, and the gall-bladder, one dense and old, between the inferior margin of the liver, near the gall-bladder, and the parietal peritoneum, another, likewise dense and old, between the duodenum and the gall-bladder. The head of the pancreas was hard and



enlarged The gall-bladder was drained by a rubber tube, reinforced by a cigarette drain

The laboratory reported the presence of occult blood in the feces, and the colon bacillus in the culture from the gall-bladder

The case of chronic cholecystitis did not present anything of special moment

*Carcinoma of the Gall-Bladder*—Cancer of the gall-bladder occurred in a man aged 26 There was no family history of carcinoma

Six months previous to operation, after the evening meal the patient experienced sudden cramp in the gall-bladder region, which was soon relieved by vomiting Such attacks have occurred frequently since then Jaundice attended each attack after the third, but was absent in the intervals

Two months before operation, patient stated that he passed gall-stones per rectum Five weeks before operation the latest attack occurred, and lasted several weeks Since the first attack the patient estimated his loss in weight at 27 pounds At the time of operation the patient was anæmic and slightly jaundiced

Abdominal section exposed an enlarged, tense gall-bladder, whose fundus and body exhibited nodules Adhesions existed between the omentum and gall-bladder After cholecystectomy, drainage, consisting of one rubber tube in the stump of the cystic duct, surrounded by a cigarette drain, and one piece of gauze in the fossa of the gall-bladder, all of which were brought out through a counter opening Culture from the contents of the gall-bladder proved sterile, but microscopical section of the gall-bladder showed the nodules to be cancerous

*Hepatic Abscess*—This case of abscess should, I think, on a *proxi* grounds, be classified under chronic cholecystitis instead of under the heading "hepatic abscess"

The patient, a laborer, aged 49, gave no history of previous infection Two months before operation he had a chill, which lasted half an hour The following morning he noticed soreness throughout the epigastrium, with much fulness here His appetite became poor A month later the soreness localized in the right hypochondriac region, and now, for the first time, he thought he could feel a mass, which was moderately tender He had no more chills The epigastric soreness changed into a gnawing pain,

which appeared, together with epigastric distention, immediately after eating

The pain in the gall-bladder was occasionally referred to the inferior angle of the right scapula

The patient stated that he had lost thirty pounds in flesh since the illness began, although it must be borne in mind that his diet was restricted during that time

Physical examination revealed moderate rigidity of the muscles in the upper right half of the abdomen, some tenderness about the umbilicus and the presence of a palpable swelling. The liver dulness extended nearly to the umbilicus. The stomach was dilated, holding a quart of water

Abdominal section revealed the gall-bladder thickened, atrophied, and bound down firmly by strong fibrous adhesions, from it fluid bile escaped. There were numerous firm adhesions between the stomach and duodenum and the liver

An abscess, the size of a small orange, was located one inch beneath the inferior surface of the liver, in close proximity to the fossa of the gall-bladder. Its walls were a quarter of an inch thick and its contents, creamy pus

Drainage consisted in three pieces of gauze, one in the gall-bladder, one in the abscess cavity, and one in the subhepatic space

Culture from the gall-bladder proved sterile

*Cirrhosis of the Liver* —There were two cases of cirrhosis of the liver operated upon, of which one was biliary, and the other was an example of Henoch's disease. The latter patient was cholæmic at operation, and died the next day

*Gastric Ulcer* —There was one case of gastric ulcer, in a woman 32 years old. She had had enteric fever eleven years previous to admission

Her illness began three months before admission with sharp cutting pains in the epigastrium, radiating low in the abdomen. Duration, three weeks

Five weeks before operation there was a second attack, similar to the first, the pain lasting up to within a few days before operation

Physical examination showed the greater curvature of the stomach four centimetres above the navel

Abdominal section and gastrotomy revealed the gastric

mucosa congested. It bled readily when touched, and rubbed off easily. Several small areas were especially hemorrhagic. After posterior gastrojejunostomy, recovery was apparently complete.

The appendix, chronically inflamed, was removed at the same time through a McBurney incision.

*Duodenal Ulcer*—There was one case of duodenal ulcer, in a man 60 years of age. His illness began nine months previous to operation, with severe dull aching pain in the epigastrium, coming on from one to two and a half hours after eating, and radiating to the shoulders. The pain lasted several hours.

Four months before operation ten teeth were extracted,—an event which naturally increased the severity of the morbidity. Shortly afterwards, the epigastric pain returned, and was followed two hours after eating by vomiting, which relieved the pain.

Three months before operation, after unusually severe pain in the right side of the epigastric region, the patient became jaundiced. From this time on the intervals between attacks were three to five days, and occasionally two weeks. During these intervals the patient was fairly comfortable. The bowels were loose, occult blood was present. The patient stated that during these nine months he had lost twenty pounds in weight.

Physical examination showed the stomach dilated, its greater curvature extending down as far as the navel. There was resistance in the epigastric region, more marked on the right.

Abdominal section revealed an ulcer in the anterior and upper walls of the first part of the duodenum which extended to the pylorus. There was no obstruction at the latter site.

Posterior gastrojejunostomy, no loop, resulted in cure. In this connection I beg to say that in my experience the operation of gastro-enterostomy (no-loop operation) in the presence of an open pylorus has not been followed by the disagreeable symptoms described by some operators. While I was doing the loop operation I did see vomiting, etc., which from my more recent experience, I must attribute in part at least to the former faulty technic.

*Carcinoma of the Stomach*—There were 3 cases of carcinoma of the stomach, all in males, aged 34, 37 and 45. There was a family history of carcinoma in all these cases. One patient's

father died of carcinoma of the stomach, another patient's father died of carcinoma of the jejunum, whilst the third patient had a sister suffering from epithelioma of the face. Common symptoms were pain, dyspepsia, vomiting, loss of weight, and in two, constipation. In 2 patients, both of whom had pyloric obstruction, the vomiting was that of retention. In all, the vomitus contained either streaks, or considerable amounts of blood. The loss of weight amounted to 20, 50 and 52 pounds.

The site of the carcinoma was, in one patient, the anterior wall, in another, the pylorus and duodenum, in the third, the pylorus and anterior and posterior walls. In all partial gastrectomy with posterior gastrojejunostomy was done. In all three cases clinical diagnosis was confirmed by microscopical examination. Subsequent history of the patient favorable, with one exception, this man died nine months after operation from what was thought to be recurrence, yet a postmortem was not made.

*Carcinoma of the Jejunum*—There was one case of carcinoma of the jejunum, in a female aged 45, whose illness began five months previous to operation, with daily vomiting. There was dull aching pain, boulemia, and loss of twenty-five pounds in weight. Occult blood was found before the operation.

Abdominal section revealed a hard, annular growth three inches beyond the duodenojejunal flexure, of hour-glass shape which caused an almost total stricture, nearly three inches long. Adhesions were present between the pylorus, the inferior surface of the liver, and the lesser omentum. Resection of the jejunum, with end to end anastomosis, and posterior gastrojejunostomy were performed.

*Carcinoma of the Intestines*—There were three cases of intestinal carcinoma, one in a male and two in females.

Carcinoma of the colon was present in a male aged 39. A sister had been operated upon for carcinoma of the breast. Six years previous to admission the patient had had an attack of dysentery. Six months before admission there appeared abdominal colic, with obstinate constipation. Three months before admission the patient was operated upon for bilateral inguinal hernia, and during his stay of three weeks in the hospital, he lost 27 pounds in weight, and since then has lost eight pounds, making a total loss of thirty-five pounds in three months. Five weeks before admission the patient noticed for the first time, blood-clots in the stool,

rectal tenesmus and borborygmi After the operation for the herniæ, the constipation was relieved, but the colic and tenesmus continued One month before admission the stools became loose and watery

Physical examination revealed, in addition to emaciation and cachexia, rigidity of the muscles in the left half of the abdomen There was dulness to the left of the navel, over an area of a little over an inch, and this dulness corresponded to a tender mass

Abdominal section disclosed a large movable mass, the size of a large orange Involved in this mass were the small gut and the mesentery No surgical procedure was employed in this case

Carcinoma of the cæcum was present in a woman aged 32, whose family history was negative Five months previous to admission this patient complained of tearing, dragging pain in the right iliac region, followed by soreness over the whole of the abdomen Six weeks before admission she noticed for the first time a lump in the right iliac fossa, just below the site of the previous pain The abdomen at this time was swollen, and this swelling increased and decreased alternately

Physical examination of the abdomen revealed considerable distention but no rigidity There was general tenderness A mass, indefinite in shape, hard and nodular to be felt in the right iliac fossa, by combined abdominal and pelvic palpation There was free fluid in the abdomen

Abdominal section permitted the escape of dark, thick, serous fluid and disclosed a malignant growth in the right iliac fossa to which the intestines were adherent The growth was extensive, but sprang, apparently, from the ileocæcal junction There were metastatic nodules on the uterus and adnexæ, floor of pelvis and anterior abdominal wall The case proved to be inoperable

There were 2 cases of carcinoma of the rectum One, a woman aged 54, whose father's sister had an epithelioma on the forehead

She had been constipated ten months before admission Since three months before admission, she had movements the size of sheep-stools, and, at times, passed a little blood There was rectal tenesmus Lately, there had been much rectal bleeding

The patient lost weight At times there was considerable pain in the sacral region

Digital examination discovered a large, hard, nodular mass, fixed in the lower half of the posterior wall of the sacrum The finger was streaked with blood when withdrawn The operation consisted in left inguinal colostomy

The second case was similar to the above and too far advanced to allow of other than a left inguinal colostomy, which was done

*Hernia*—There were 12 operations for the radical cure of inguinal hernia, 10 were in males, and 2 in females Seven of these were on the right side and 4 on the left in one case the site of the hernia was not recorded There were two cases of congenital hernia the father of one of these patients also had a hernia Trusses were worn in 8 cases The duration varied from one to thirty years Four were ruptured by heavy lifting Concomitant pathological conditions consisted in varicocele in two cases, chronic appendicitis in two, acute appendicitis in one, and in another case, part of the cæcum with the appendix was in the sac Incisional hernia was present in addition to inguinal hernia and chronic appendicitis in a woman who had had an abdominal section four years previously There was one ventral hernia

There were 2 cases of strangulated femoral hernia, both of which recovered

There were 2 cases of umbilical hernia, both in females One patient had the rupture for three years, and could assign no cause to it, but notes in the history show that she was very stout, and had borne five children The other woman acquired the hernia when fourteen years old, or 28 years before operation, by heavy lifting The hernia protruded two and a half inches beyond the navel, and was seven inches in diameter Its contents were omentum and gut, and, as is usual in long standing cases, many adhesions The appendix, the seat of chronic obliterative inflammation, was removed at the same time

There were two cases of incisional hernia, both in females One case had in addition an inguinal hernia and a chronic appendicitis The other patient had been operated fifteen months previously and an appendiceal abscess evacuated through a three inch incision She then returned to her work in a hosiery mill,

where considerable standing was required. She wore an abdominal belt for a period of eleven months after the operation, and then dispensed with it. One month later the scar relaxed. At operation, numerous adhesions were broken up, and a chronically inflamed appendix removed.

*Wandering Kidney*—There were 6 cases of wandering kidney, four in males and two in females, and all on the right side. Analysis of the case histories shows that symptoms, aside from pain, were few. In all cases, the pain was in the right lumbar and hypochondriac regions and varied in character from numbness, or dull and aching, to severe and stabbing, like renal colic. In one case pain was aggravated by standing in one position and in another by motion. In one case it radiated to the glans penis, and, in another, to the right testicle. Pain in wandering kidney so frequently resembles that in renal calculus as often to make the diagnosis very doubtful. Associated with the pain was nausea in one case, and vomiting, which relieved the pain, in another. Urinary symptoms, though usually frequent, are mentioned but once, and here consisted in difficulty in starting the stream. Two patients complained of constipation. One patient had a chronically inflamed appendix removed at the same time. Another had diastasis of the recti with visera optosis, and a split celery-stalk laceration of the cervix. In this instance, conservative treatment, by means of abdominal binder, would probably have fulfilled the indications better than operation. Anchorage, in five cases, consisted in separation of a triangular flap of the true capsule, twisting of this flap, and suturing of it into the anterior layer of the lumbar fascia, and quadratus lumborum muscle. In the sixth case the kidney was anchored by means of polar gauze. The presence of hæmaturia in a percentage of cases of very movable kidney has been my experience, also jaundice in a few.

*Pyonephrosis*—There were 4 cases of pyonephrosis, three in males and one in a female. Two were on the right side and two on the left. The etiology of this condition was, in two cases renal calculus, in another tuberculosis. The fourth case, while the cause is not mentioned, I believe was consecutive upon wandering kidney.

Both of the cases which were due to long-standing calculous disease, were in males, and both died. The ideal time to operate would have been of course in the pre-suppurative stage. In all

suppurative states, the surgeon is more or less subservient to the caprices of infection. In one of these patients, the calculous history had existed since the patient was fourteen years of age, or for twenty-seven years. Infection began five months previous to operation, when he noticed for the first time, pus in the urine. In addition to the attacks of renal colic, in which the pain was referred down the right ureter and also to the right testicle, there was dysuria, and profuse sweats at frequent intervals.

Physical examination showed that the patient was anæmic and decidedly septic. There was a tender mass in the right hypochondrium. Nephrotomy revealed a kidney enlarged and disintegrated, from which a basinful of greenish-yellow pus was removed. Near the vesical end of the ureter a softened calculus was removed. The kidney was extirpated. Drainage was established by three pieces of gauze. The laboratory reported chronic suppurative nephritis and ureteritis.

The other patient had had a calculus removed from the left kidney eight months previous to operation, and a month later the calculous history on the right side was inaugurated. The time of inception of infection was not definitely stated. There was progressive loss of weight and strength, increased frequency of urination in the day, and headaches towards evening. Functional activity of the left kidney was established by ureteral catheterization.

Nephrotomy gave vent to a large amount of thick, foul, yellowish pus. The ureter was much thickened, and dilated, and near its vesical end contained a small calculus.

The patient with tuberculous pyonephrosis had had her condition for six years. Seven weeks previous to the present operation an abscess of the left kidney, which had ruptured, was evacuated. However, in spite of this, the same dull aching pain persisted, together with a sinus, which repeatedly opened and closed. Nephrectomy.

*Pyelonephritis*—There was one case of pyelonephritis, in a woman aged 31, who gave a definite history of previous infection. Two weeks before the operation she noticed for the first time, the urinary symptoms of pain after micturition, frequency and urgency, and consequent passage of small amounts of urine. Ten days before admission, she experienced violent, sharp, shooting pains in the right iliac region, and aggravated by motion. The



next morning and for two days after there were chills, fever, sweats, and vomiting, and up to time of operation constant high fever persisted

Physical examination revealed marked tenderness in the right lower hypochondriac region anteriorly, and lumbar region posteriorly. Palpation caused exquisite pain

Nephrotomy showed an enlarged, inflamed kidney that contained a large amount of pus

*Renal Calculus*—There was one case of renal calculus, which occurred in a man aged 52. For twelve years preceding operation this patient had suffered from periodic—i. e. every four months—attacks of sharp, cutting pain at a localized point in the left lumbar region, and without radiation. Later on, the attacks were more frequent and severe, and the pain radiated along the left ureter to the testicle. These attacks lasted from one to two hours, were accompanied by chill, and occasionally by vomiting. Nephrotomy, with removal of a calculus from the pelvis of the ureter

On the eighth day after operation, there was a severe attack of renal colic, followed by increased frequency of urination, and the passage of a shower of calculi, which varied in size from a millet to a mustard seed

In all my kidney cases it is my practice, with few exceptions, to have cystoscopic and ureteral catheterization, this is done by one of two members of our staff, Dr Alexander Uhle or Dr William McKinney. I cannot lay too much stress upon this practice, the importance of which I need not dwell upon, as I am sure all of the Fellows will agree with me in this

*Hypertrophy of the Prostate Gland*—This patient, 65 years old, suffered, more than twelve years before operation, from pain before, during, and after urination, from increased frequency, and, at times, from sudden blockage of the stream, with dribbling. For twelve years he has led a catheter life

Ten years ago pus and blood appeared in the urine at intervals of three months. On admission, the patient had pain, referred to the end of the penis, occasional priapism, vesical tenesmus, and often difficulty at stool. At operation there was removed by the suprapubic route, a calculus, the size of a peach-stone, and a much enlarged prostate

*Sarcoma of the Prostate*—There was one case of sarcoma of the prostate, which occurred in a patient 69 years of age. Nine months previous to operation he began to suffer from frequency of urination, with dysuria and hæmaturia. On admission, the frequency amounted to one to two hours by day, and five to six times by night. Complaints of severe pain in sacrum. Rectal examination revealed the prostate soft, tender, and uniformly enlarged to the size of a large orange.

Suprapubic operation confirmed rectal palpation, and showed, further, that the growth was very vascular, and so soft that it ruptured during manipulation,—an event that necessitated removal piecemeal. The resulting cavity was as large as a fist, and bled freely. Drainage consisted of one Freyer tube in the bladder. Six hours after the operation profuse bleeding, which required gauze packing to control it, occurred. Saline intravenous infusion two quarts, was administered. Microscopical examination confirmed the clinical diagnosis of sarcoma.

Cystoscopic examination in enlargement of the prostate is equally as important as is cystoscopy and ureteral catheterization in kidney conditions.

*Carcinoma of the Breast*—There were six cases of carcinoma of the breast, all in women, although last year I reported an instance of this in a male. The ages were from 32 to 45, with the somewhat low average of 37 years. The right breast was involved in five and the left breast in one. One patient gave a family history of cancer, and one a history of traumatism.

The duration was three months in one case, six months in three, and nine months in one. Pain in the breast was described as sharp and shooting in two cases, and stabbing in another. Involvement of the axillary nodes was present in two cases. Radical operation was performed in four cases. In all drainage of the axilla was carried out by means of a rubber tube.

*Tuberculosis of the Breast*—There was one case of tuberculosis of the left breast in a woman aged 44. Three years previous to operation, the patient experienced for the first time, pain in the left breast. Five months before operation, she noticed, for the first time, a tumor, which has grown rapidly. Small areas became tender, inflamed and swollen, and then broke down and discharged foul pus. Examination of the breast revealed a round, red, slightly elevated area, the size of a silver quarter,

in the centre of which was a sinus discharging non-odorous pus this area was situated above, and slightly to the outer side of the nipple. Above this there was another similar area, not so red, and without a sinus. Beneath these spots there was an ill-defined, irregular, fairly hard, moderately tender growth. Radical operation was performed, and the axilla drained by a rubber tube. Microscopical study showed tuberculosis.

*Fibroid of Uterus*—There were 8 cases of fibroid tumor of the uterus, of which one was complicated by carcinoma, under which caption it will be considered. The duration of the disease was six weeks in one case, one year in two, two and a half years in two. The pain was dragging or bearing down, lumbar or sacral, radiating down the thigh in one, and aggravated by the menses in another. Metrorrhagia was present in four cases, and in two was profuse and clotted. Four complained of leucorrhœa. In two cases there was increased frequency and urgency of urination. At operation, which was supravaginal, amputation of the body of the uterus and adnexæ in three cases, uterus with the left tube and ovary in two cases, uterus with both tubes and right ovary in one case. The appendix was the seat of disease, and for this reason was removed in five cases. One patient who had a fibroid removed fifteen years previously through the vagina, showed at operation a right intraligamentary cyst, chronic appendicitis, and adhesions between the ileum and the vagina.<sup>†</sup>

*Carcinoma of Uterus*—There were 4 cases of carcinoma of the uterus, all in married women, whose ages were 42, 46, 47 and 49. There was no family history of carcinoma, nor any history of trauma apart from that ordinarily attending childbirth. The duration was three months in one, four months in another, and indefinite in the other two.

Metrorrhagia was present in two cases. In the case complicated by fibroid it contained clots, in the other case it was profuse, and before admission, foul. In all these cases the cervix was the seat of the malignancy.

Operation was performed by the abdominal route in 3 cases, and by the vaginal in one. One case was complicated by fibroid

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\*In addition to the above cases of fibroid uterus, an example of subserous fibroid removed by myomectomy will be referred to under "Diseases of the Tubes and Ovaries."

and showed, in addition, chronic appendicitis, the uterus with the adnexæ, the uterine third of the vagina, and the appendix were removed

Another case was complicated by polyp, and showed chronic appendicitis, complete abdominal hysterectomy and appendectomy were performed. Upon the third patient it was intended to perform trachelorrhaphy and perineorrhaphy, which had existed since childbirth, four and a half years. The cervix showed a stellate laceration, and was unduly hard, thus creating the suspicion of carcinoma. Therefore, the uterus was removed by the vaginal route, and the perineum repaired. The diagnosis of malignancy was confirmed by microscopical examination. Here, then, was a very early carcinoma, springing from the site of a lacerated cervix—and the conclusion may properly be drawn, that trauma was the cause of malignancy in this patient.

*Prolapse of the Uterus*—There were four cases of prolapse of the uterus. Operation consisted in vaginal hysterectomy in two, ventrofixation, perineorrhaphy, anterior colporrhaphy, and, incidentally, appendectomy for chronic appendicitis in one, and in the remaining case, Dudley's operation, together with amputation of a redundant cervix, and repair of a lacerated perineum. One of these patients had decidedly weak abdomino-pelvic musculature, having been operated upon four years previously, for femoral and inguinal hernia, and lacerated cervix and perineum. There was one death in this series.

*Chronic Metritis and Endometritis*—There were 4 cases of chronic metritis and endometritis in multiparæ, of whom two had borne eight children each, and one two children. Operation in two cases consisted in hysterectomy by the vaginal route, in one of these the uterus was, in addition, retroverted. Two cases were cured by complete abdominal hysterectomy, in one, at the same sitting, appendectomy for chronic appendicitis, and perineorrhaphy, for rectocele.

In all these cases the microscopical examination showed arterio-sclerosis and hyperplastic endometritis. It is my belief after a considerable experience in dealing with this class of cases that this is the only rational treatment. I have had the opportunity of observing cases a long time after operation, and in-

variably the immediate as well as the remote results have been most satisfactory to patient as well as surgeon

This may be thought to be too radical treatment, but in being so radical it is conservative in the true sense of the word in that it is the best possible safeguard against the development of carcinoma which will take place in some of these cases if left alone and more likely to if subjected to traumatism by the ill-advised use of the curette

*Diseases of the Tubes and Ovaries*—There were 12 cases of tubo-ovarian disease. Miscarriages had occurred in five of these patients, one of whom had eight. Of these patients who had had miscarriages, the character of the pain in four betrayed a some-time pelvic peritonitis. The pain was usually in the pelvis, and was sharp, or sharp and shooting, or cutting in seven patients, four of whom had had a miscarriage. This pain was accompanied by chills and fever in two, and was followed by nausea and vomiting in two more. There was bearing down pain in two patients. The pain was referred down both lower limbs in one and up to the inferior angle of the left scapula, and down to the left knee in another, who suffered from left-sided salpingo-oophoritis. In two cases there was frequency and urgency of urination. The menses were irregular in five patients, of whom four had menorrhagia; they were scanty in another. Dysmenorrhœa was present in five patients, leucorrhœa in five, and constipation in six. Associated conditions consisted of chronic appendicitis in all the twelve cases, retroversion in two, endometritis in two, and bilateral hydrosalpinx in one. The operations consisted of appendectomy in all cases, of bilateral salpingo-oophorectomy in five, in two of which the uterus being adherent, was freed, of left salpingo-oophorectomy, with resection of the right ovary, and right salpingectomy in four cases, in one of which a myomectomy was performed, of right salpingo-oophorectomy in two, and of complete abdominal hysterectomy in another patient, who had a severe fundal endometritis.

In addition to the operations described above, fifty-two others of less interest were also performed in the Clinics

# TRANSACTIONS

## OF THE

### NEW YORK SURGICAL SOCIETY.

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*Stated Meeting, January 22, 1908*

The President, DR JOSEPH A BLAKE, in the Chair

#### FACIAL NEURALGIA TREATED BY ALCOHOL INJECTIONS

DR OTTO G T KILIANI presented a woman, 70 years old, who, when she first came under his observation in August, 1907, complained of severe neuralgia of the second and third branches of the facial nerve, of 25 years standing. Her chief pain was in the tip and left side of the tongue. Three injections of 2 c c of 80 per cent alcohol were made into the second branch of the nerve and three into the third branch. The patient remained entirely free from pain until about three weeks ago, when she again complained of some pain in the tip of the tongue which disappeared after a single injection.

As a result of the last injection, the patient had a slight temporary paresis of the left facial muscle. This is due to the connection of the second branch of the trigeminus with the facial nerve through the nervus petrosus superficialis major and the nervus caudi pterygoidei.

DR KILIANI presented, also, a man, 55 years old, who was admitted to the German Hospital on September 24, 1906, complaining of frequent pains, with twitching, of the right cheek. His family history was negative, and the patient had been generally healthy up to the onset of his present illness.

Three years ago he began to suffer with mild attacks of pain in the right cheek from the region of the parotid gland forward to the right angle of the mouth and in the lower teeth on the same side. These attacks had gradually increased in frequency and severity, and when he was admitted to the hospital they would occur every few minutes. The paroxysms were started by any

irritation of the right cheek or of the right lower teeth. He also complained of roaring and impaired hearing of the right ear. The attacks of pain were characterized by an interval of agony, during which the patient rocked back and forth, rubbing the affected cheek with a handkerchief or the back of the hand. The attacks were much more frequent during the day than at night.

On October 16, 1906, the patient was given an injection of 2 c c of 80 per cent ethyl alcohol into the inferior dental foramen. On the two following days he had several hundred attacks of pain. On October 19 he received a second injection, and on the following day he only had six attacks in twenty-four hours. On October 21 he had only three attacks during the day, and for the first time slept well at night. On October 25 he received his third injection. This was followed by a temporary increase in the number of attacks, but on the three following days he was much improved. On October 30 he had a relapse, with fifty or seventy-five attacks during the day and six at night. On October 31 he received his fourth injection, followed by slight improvement. Subsequent to this he received four more injections, and since the last one, which was given on November 17, 1906, he had remained entirely free from pain, a period of about sixteen months.

The severity of this case, Dr Kiliani said, could be judged by the fact that while in the hospital the patient had had over a thousand attacks of tic. At times he was absolutely insane with pain, requiring the care of two orderlies. Morphine and the bromides apparently gave him no relief.

DR KILIANI presented, also, a man, 73 years old, who when 25 years old was struck under the right eye by a fist. Five weeks later he felt needle-like pains of the right side of the face. These were of brief duration, and recurred four or five times daily. After about six months they disappeared entirely for a year. They then recurred in the same location, but were more severe. The attacks would disappear for several months, and then recur, each time stronger, and in 1880 they were so severe that he had a section of the infra-orbital nerve excised. During the next five years this operation was repeated three times without much benefit, and in 1898 he had the Gasserian ganglion resected, after

which he was free from pain for one year. In 1904, he had a secondary operation performed on the ganglion without effect.

When the patient came under Dr Kiliani's observation, in December, 1906, he was having about a hundred attacks of pain a day. After three injections into the foramen ovale his attacks of pain, as well as his facial tic, disappeared, and he had remained entirely well since.

In explaining the technic of the operation, Dr Kiliani said the needle was introduced through the cheek externally, and without perforating the mucous membrane it was run up along the pterygoid process to the base of the skull until the foramen was reached.

#### INTERSCAPULO-THORACIC AMPUTATION FOR SARCOMA

DR BENJAMIN T TILTON presented a boy of seventeen years who had enjoyed perfect health up to the latter part of September, 1907, when he fell from a bicycle, striking his left shoulder. Five weeks later he noticed a swelling in this region which gradually grew larger. He began to have very severe pain, especially at night, and was unable to sleep.

When Dr Tilton saw the patient for the first time, on December 14, seven weeks after the accident, he found a tumor of the shoulder approaching the size of a child's head. The superficial veins were enlarged, and there was an indistinct pulsation. There were no glandular enlargements, but the pectoral muscles seemed to be involved in the growth. On account of the extremely rapid growth of the tumor and the probable involvement of the adjacent muscles attached to the humerus and scapula, it was decided that nothing short of a complete removal of the shoulder girdle would suffice. To this the patient and his family readily consented, as the pain had become intolerable. Interscapulo-thoracic amputation was done by Dr Tilton on December 16, 1907. The usual Berger incision was made, the clavicle divided at its inner third with a chain saw, and the subclavian vessels exposed and tied. After division of the brachial plexus, the muscles attached to the humerus and scapula were divided in turn, the terminal branches of the three scapular arteries being divided as they were reached. The hemorrhage was very slight, the wound healed promptly, and the boy went home on the eighth day. Since then he had felt perfectly well, and had gained some weight.



A pathological examination of the tumor by Dr James Ewing showed it to be a giant-celled sarcoma having its origin, apparently, in the head of the humerus, which was completely replaced by the soft tumor, which had also infiltrated the muscles and the shoulder-joint

#### RESECTION OF HUMERUS FOR SARCOMA

DR HOWARD LILIENTHAL presented a man, about 35 years old, who had been presented at one of the former meetings of the Society, and was now shown again after a year had elapsed since the time of operation

The case was originally one of round-celled sarcoma involving the upper part of the shaft of the humerus. A section of the growth was removed, and the diagnosis confirmed by pathological examination. An interscapulo-thoracic amputation was indicated, although a simple disarticulation at the shoulder might have sufficed, but the patient absolutely refused to consent to an operation which would involve the loss of his arm.

About a year ago Dr Lilienthal resected the humerus from the surgical neck down to a point about two and a half inches above the elbow and filled the gap in the bone with an aluminum inter-medullary splint, as devised by Dr Charles A. Elsberg. When the patient was first shown at a meeting of the Society, some of the members feared that the aluminum splint would in the course of time become dissolved, and Dr F. W. Murray suggested that it might be replaced with a gold-plated silver splint, the idea being that that would be permanent. Such a splint was subsequently introduced, and it was worn for some months, but it acted as a foreign body and proved useless. During much of this time the patient was receiving injections of Coley's mixed toxins. He failed to improve, however. On the contrary, he began to lose weight, he had a constant pain in the arm, with a discharging sinus. The splint was thereupon removed, and the wound was allowed to heal, which it did very promptly. Although at the time of the original operation unmistakable sarcomatous tissue was left behind, it had apparently disappeared when the splint was removed. The patient now wore a rather cumbersome artificial humerus in the shape of an external apparatus, with which he was able to get along pretty well.

Dr Lihenthal said the point he wished to bring out in connection with this patient was whether in a case of this character in which there was not yet extensive involvement of the soft parts, as there was in Dr Tilton's case, it would not be well to think twice before submitting the patient to such a serious operation as an interscapulo-thoracic amputation. In the case he had shown he had no doubt that the use of Coley's fluid had considerable to do with the non-recurrence and the disappearance of the sarcomatous tissue. The final outcome, of course, was still uncertain, but the man was certainly a good deal better off than he would be if he had submitted to an amputation.

#### ENTEROSTOMY FOR PARALYTIC OBSTRUCTION

DR ELLSWORTH ELIOT, JR, presented a girl, eleven years old, who gave a history of an attack of appendicitis two years ago, from which she recovered, without operation, after a month's illness. She was admitted to the Presbyterian Hospital in April, 1907, suffering from a second attack of appendicitis of two days' duration, with vomiting, pain and abdominal rigidity and distention. The abdomen was opened through an intermuscular incision and subsequently a short median incision below the umbilicus. A gangrenous appendix was found, containing an enterolith and perforated near its distal extremity. There were no adhesions. There was a considerable amount of free sero-purulent fluid in the peritoneal cavity. After removal of the appendix, the peritoneal cavity was irrigated and two cigarette drains were inserted.

The patient continued to vomit for three days after the operation. The bowels moved on the second day, and the patient gradually improved until the seventh day, when there was a rise in pulse and temperature, together with paroxysmal attacks of pain and rigidity over the left lower rectus. On the tenth day the vomiting re-appeared, with constipation and abdominal distention and a small mass could be felt in the hollow of the sacrum. The leucocyte count was 36,000. Upon re-opening the abdomen, the small intestine was found to be greatly dilated, of a dull color, and covered with fibrinous flakes. On separation of the adhesions, an abscess containing several ounces of foul pus, and situated in Douglas's cul-de-sac, was opened and drained. To the edges of a small separate incision above, a distended loop

of the ileum was sutured and a Nelaton's catheter No 15 was inserted through a small orifice into its cavity

On the day following the operation, the temperature had fallen from 105° to 102°, the pulse from 150 to 120, and the distention and rigidity were distinctly less. The intestinal fistula discharged abundantly and on the third day, the bowels moved naturally. The local and general improvement continued without further interruption, the catheter being removed at the end of the second week. The persistence of the intestinal fistula required a second operation for its closure, which was done by Dr Wanbaly three months after her admission to the hospital, the orifice being freed from the parietal peritoneum and closed by Lembert sutures. The patient, at present, enjoys excellent health.

DR ELIOT also presented a girl, 16 years old, who was admitted to the Presbyterian Hospital on November 21, 1907. She had always enjoyed excellent health until four days before admission, when she was seized with an attack of nausea and constipation which, however, did not prevent her from continuing at her work until 24 hours before she came to the hospital. She then complained of abdominal pain, general in character, associated with vomiting and marked prostration. The patient was apathetic and presented the signs of peritonitis which was general, excepting in the epigastric region, with flatness in both flanks. The extremities were cold. Her temperature, on admission, was 101, the pulse was feeble, ranging from 130 to 140. The leucocyte count was 28,000, with a differential count of 85.5 per cent.

Under chloroform, an intermuscular incision was made into the abdomen, together with a small median incision. The appendix was found firmly bound down, and was not removed. The peritoneal cavity, which was found filled with sero-pus, was irrigated, and a cigarette drain was inserted into the pelvis. Twelve hours after the operation the pulse could not be felt at the wrist. Slight improvement followed infusion and free stimulation, the pulse ranging between 140 and 170, but very faint and irregular. There was, on the other hand, immediate improvement in the abdominal condition, the rigidity and distention being much less marked.

On the second day after operation, the pulse had decreased to 120-130 and was much stronger. The patient had two light

brown movements after enemata, there was still occasional vomiting although the greater part of her fluid nourishment was retained

The condition continued to improve slightly until the fifth day, when severe abdominal pains, of increasing intensity, especially in the left lower quadrant appeared, and the patient's general condition became weaker. The vomiting increased in frequency and became fecaloid and distention of the entire abdomen became almost as pronounced as at the time of her admission to the hospital. There was dulness in the left flank.

Under chloroform, an incision one inch in length was made in the left flank and a small amount of serous fluid evacuated. A similar incision was made in the median line above the umbilicus, through which an enterostomy was made as in the previous case.

The operation was followed by immediate and complete relief of pain, vomiting and distention, with improvement of the general condition, especially the pulse. After the first few hours all fluids were easily retained. The intestinal fistula discharged freely. The bowels moved first on the third day and afterward at regular intervals. The Nelaton catheter was removed on the seventh day and the orifice promptly closed.

The patient's general condition at present is excellent.

#### USE OF THYROID SERUM IN THE TREATMENT OF EXOPHTHALMIC GOITRE

DR JOHN ROGERS presented a number of patients who had been treated with injections of thyroid serum for exophthalmic goitre. He said that some working hypothesis for the function of the thyroid gland is a necessity in the treatment of exophthalmic goitre. It is therefore assumed that the secretion, being intimately associated with the function of every organ and tissue in the body, contains a principle which controls oxidation and another ingredient governing the vasomotor system. In Graves' disease the secretion is excessive and so increases or "activates" the chemical changes in every organ and tissue and returns in the circulation to its source thus activating the thyroid and making a vicious circle. Any therapeutic measure which breaks this circle tends to cure the disease. As the disease progresses however the thyroid secretion becomes of poorer and poorer

quality and although the vasomotor element seems to be at almost all stages of the process capable of stimulating the heart to overact the so-called oxidative principle apparently becomes less and less efficient

The antithyroid serum is made by injecting rabbits or sheep with the combined nucleoproteid and thyroglobuline obtained from the human thyroid gland. The serum made from the pathological gland of Graves' disease has probably a better therapeutic effect than that made from the normal organ. Certain patients however do not improve under the administration of antiserum or rather under antithyroid treatment and prothyroid treatment must be employed either alone or in combination with the antiserum. For this purpose there can be given by mouth the nucleoproteid material of sheep thyroids or by hypodermic the nucleoproteid material derived from the normal human thyroid. After some experimentation it was found that sheep thyroid could not be given hypodermically for any length of time without causing unpleasant nervous symptoms whereas human thyroid can be tolerated indefinitely. It is possible that an antibody to a foreign proteid has here to be considered.

CASE I—Came under observation in June, 1906. She had had typical exophthalmic goitre for about 6 months. The symptoms began with goitre and followed her entrance on the duties of a trained nurse. During June and July, 1906, she received 13 injections of about 10 minims of antiserum and improved enough to lead a hygienic life in the country until November. During November and December, 1906, the injections were resumed about once a week. In January, 1907, the only symptom left was the soft goitre. This has gradually shrunk and at present has entirely disappeared and the result seems to be a perfect cure. The only treatment has been antiserum and general hygiene.

CASE II—Came under observation in December, 1907. She presented typical exophthalmic goitre with rather severe symptoms of about 3 years' duration, following the strenuous care of a sick child. The goitre was small and firm. Two injections of an active antiserum aggravated all the symptoms and produced nausea, vomiting and diarrhoea. She was then given hypodermically 3 minims of a 1:1000 solution of the normal human thyroid nucleoproteid with almost immediate relief.

This has been continued once daily with steady improvement and a softening and a shrinkage of the goitre. The nervousness and sleeplessness disappeared, the pulse which was 140 to 160 after the antiserum injections now averages about 90, and there are no subjective symptoms. It must be supposed in this case that the small, hard goitre produced an excess of a weak secretion, that the antiserum by inhibiting the epithelial chemistry, made the secretion of still poorer quality, but the automatic demand for the secretion forced a large output containing a very poor oxidative portion and enough cardio-accelerator to make the heart beat very rapidly, then the administration of the normal thyroid nucleoproteid, supposed to contain only the needed oxidative part of the secretion, supplied the deficiency and the automatic mechanism did not force the thyroid to over act. As this oxidative enzyme (?) improved the general nutrition the strain upon the thyroid was lessened and its own nutrition in turn improved and a gradual restoration to the normal is occurring.

CASE III — Presented a typical picture of exophthalmic goitre with cutaneous pigmentation and a small hard goitre. There were also signs of a melancholic psychosis. The symptoms were of about 7 years' duration, with exacerbations and remissions. In September, 1905, the pulse averaged about 140. Under antiserum injections, about twice weekly, all symptoms disappeared towards the end of December, and she returned to work as a machine seamstress. In February, 1906, there was a moderate exacerbation of thyroidism which was subdued by antiserum, and in August a repetition of this. At the next exacerbation in January, 1907, the right lobe and isthmus of the thyroid were removed in hopes of a cure. Recovery of full strength was very slow, but after several months of good hygiene in the country she returned to work in September, 1907, apparently in perfect health. Nevertheless about the first of January, 1908, she reappeared with the typical symptoms, a pulse of 140 and pronounced melancholic depression. As she might be supposed to be suffering from an excess of a poor quality of secretion from a damaged and mutilated gland, she received 5 minims of the 1:1000 solution of human thyroid nucleoproteid once daily for a week. The symptoms almost immediately subsided and now she is apparently normal again.

CASE IV — Came under observation in February, 1906. She

presented a typical picture of exophthalmic goitre with a pulse of 110-120, but with pronounced nervous symptoms, especially sleeplessness. The thyroid was about three times as large as normal. Under the antiserum injections all symptoms had practically disappeared at the end of two months, but the patient was exceedingly weak and prostrated. Instead of waiting and allowing the general nutrition to improve and with it the thyroid and the character and quality of its secretion, the antiserum, after a brief respite, was again administered and nausea with a bad diarrhoea and emaciation followed. It may be presumed that prothyroid treatment, to help out the impaired chemistry in such organs as the liver and gastro-intestinal tract, was needed instead of antithyroid serum. The bad condition finally forced an abandonment of the antiserum and under general tonic treatment much improvement followed. The patient returned to Sweden for a vacation in July, but a relapse followed and in September, 1906, in Stockholm the right thyroid lobe was removed and the left superior thyroid artery tied. She seems to have barely escaped death after this operation, and recovery was very slow and incomplete. November, 1907, she presented herself again with all the typical signs more pronounced than in February, 1906, with a pulse of 140-150, but she had gained greatly in weight and was very stout. As there was presumably an excess of a secretion of very poor quality from the mutilated and damaged gland, she was given  $\frac{1}{200}$  of a grain of sheep thyroid nucleoproteid by mouth four times daily. There was an almost immediate loss of superfluous fat, a gain in strength and sleep became natural, and the pulse now averages about 90 to the minute, but the exophthalmos and goitre are as bad as ever. The sheep thyroid nucleoproteid is supposed to be in just sufficient dose to supply the (thyroid) needs of the liver and gastro-intestinal tract, thus at the same time improving the general nutrition and with it that of the patient's thyroid gland and the quality of its secretion, and also relieving the strain on the thyroid. If the sheep thyroid nucleoproteid is given in excess it aggravates the thyroidism apparently by passing into the circulation and activating the thyroid.

CASE V—Was a child of 13, with a large simple goitre, who shows the apparent essential unity in the origin of all goitres and their rational treatment. The goitre here was first noted a year

previously when the patient was growing rapidly and much pressed with studies and night work. In September, 1907, the goitre extended from the chin to the sternum and was tense and smooth. The child was anæmic, thin, very restless and wakeful at night, but had no Graves' disease symptoms, except the pulse after excitement or exertion often rose to 120-130. She was given  $\frac{1}{200}$  of a grain of sheep thyroid nucleoprotein, taken out of school and kept in bed during the morning and as quiet as possible on the porch after luncheon. Now three months have passed and she has gained 15 pounds in weight and is perfectly normal except for the rather large soft goitre. The neck measures 3 inches less in circumference.

Here nervous and physical strains in a growing child may be supposed to have overtaxed the thyroid which hypertrophied to supply its needed secretion. Rest and thyroid proteins by mouth relieved the demands on the thyroid and at the same time aided nutrition. Surgical removal of part of the goitre would probably have made a bad condition worse. From these examples it can be inferred that surgery offers by no means an ideal treatment for Graves' disease. The operation is not free from danger and relapse or failure to cure in addition to a protracted convalescence has been so common in his experience that he believes the specific anti- or prothyroid treatment should always be tried first. He has lately found that cases which do not yield readily to the anti-serum will often do much better after ligation of one or both superior thyroids. This can be done under cocaine and is entirely without risk. Specific treatment subsequently then seems much more efficacious. It is far easier to give the counter-indications for operation than it is to choose the patients who will do well. The acute severe types of Graves' disease especially if fever is present are notoriously bad risks. He has also found that the rather rare type with psychoses are prone to die soon after operation. Almost the only cases in which operation seems to be indicated, if the serum can be obtained, are those who have possessed for years a nodular irregular goitre and who develop signs of thyroidism long after the goitre. Excision of the most diseased lobe seems generally curative. But after all operations on patients with Graves' disease a long period of convalescence must be expected, and during this period the utmost attention must be given to the general health and to careful hygiene, other-



wise a relapse is common Time must be given for the over-taxed and worn out thyroid to regain its nutrition and capacity for normal functionation

### MADELUNG'S DEFORMITY OF THE HANDS

DR WILLIAM B BRINSMADE presented a girl of fifteen years, family history good The only history of injury that could be obtained was that her arms were once twisted by a small boy, but this seemed to have made no impression at the time

About September, 1905, the mother first noticed a prominence of the right ulna, the deformity gradually increasing and attaining its present size early in 1907 The following November the mother noticed a prominence of the left ulna at the wrist

Examination showed a bowing of the radius more marked in the right arm than in the left The right carpal bones were separated from the radius and displaced forward The same condition existed on the left side, but to a less marked degree There was a slight bowing of the right tibia, and the patient had a tendency to lean to the right side after standing for a time There were no exostoses The urine was normal, and the blood examination was negative The patient had measles and whooping cough as a child, but had otherwise enjoyed good health She was undersized, as were her parents, but was unusually intelligent and well developed

Pels-Leusden in speaking of this rather rare deformity—says that more recent investigations show a luxation of the radio-ulnar rather than the radiocarpal joint He also says that formerly, curvature of the radius, pressure atrophy, muscular traction of the more powerful flexors and rhachitis were held responsible for the deformity

He showed by X-ray pictures of the hand that disturbances of growth exist similar to that seen in multiple cartilaginous exostosis The arrangement of the intermediary cartilages was irregular and ossification on the ulnar side premature, and aside from this other growth disturbances were seen, such as diminished longitudinal growth and swellings and fissures in the vicinity of the epiphyseal lines

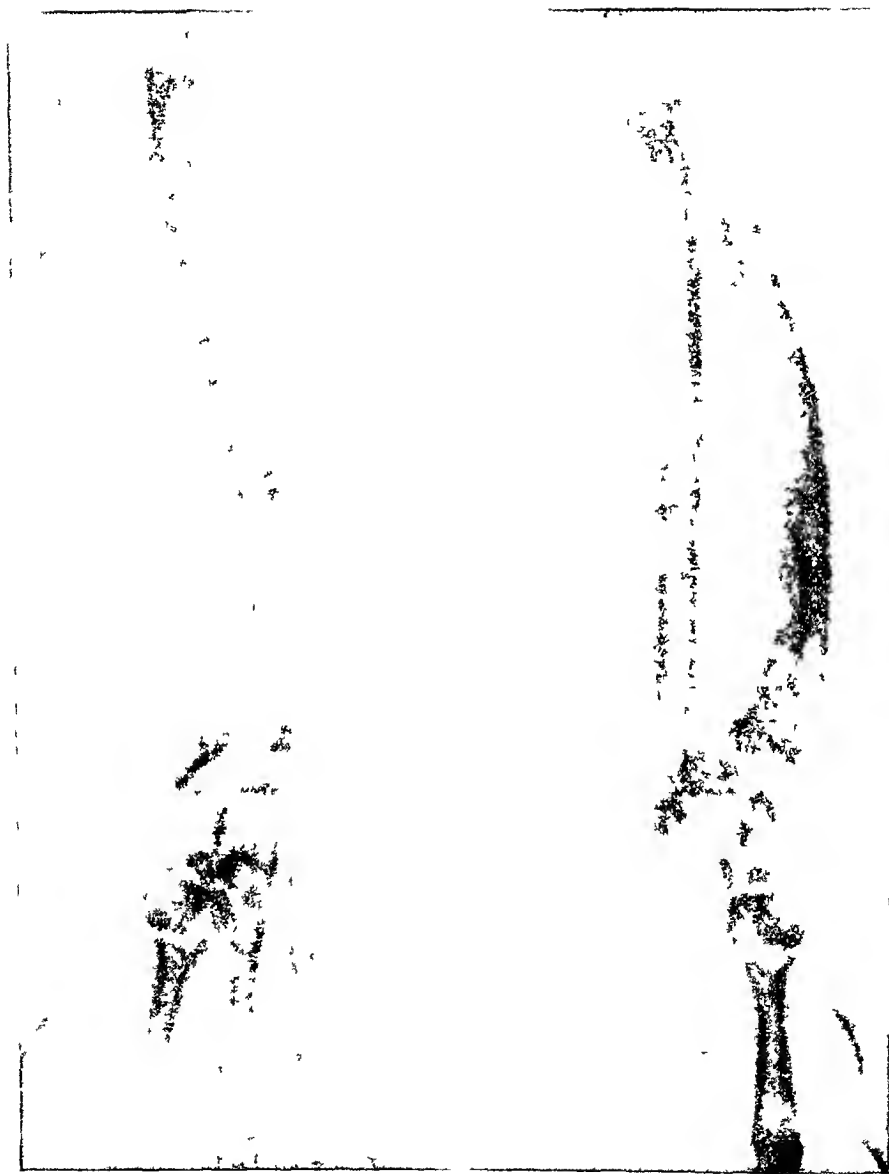
Pels-Leusden therefore concludes that the lesion primarily involves the intermediary cartilages and has nothing to do with rhachitis



Madelung's deformity of the hand

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FIG 2



Madelung's deformity of the hand

A careful examination of the X-ray plates (Figs 1 and 2) showed a condition which corresponded to the description given above

## REFERENCES

- <sup>1</sup> Archiv f klin Chir, Bd xxiii
- <sup>2</sup> Bruns Beitrage f klin Chir, vol 48, p 179
- <sup>3</sup> Centralblatt f Chir, 1907, p 190
- <sup>4</sup> Siegrist Deutsche Zeitschrift fur Chirurgie, Jan 1908, an elaborate article which contains a complete review of the subject with all the published cases

## PLATE FOR DEFECTS OF THE SKULL

DR CHARLES A. ELSBERG presented a boy of 10 years who was admitted to Mt Sinai Hospital on May 22, 1907. One-half hour before admission he had fallen out of a second story window. He was brought to the hospital in a semi-conscious condition, with clonic and tonic convulsions of the right side of the face and of the right upper extremity. There was a large hæmatoma in the left parietal region. At the operation by Dr. Lilienthal there was found a depressed fracture, with considerable splintering of the fragments and an irregular fissured fracture running across the median line to the right parietal region. A large amount of bone had to be removed. There was a large extradural blood clot. Forty-eight hours after the operation there was a complete paralysis of the right side of the body. In the belief that there was blood underneath the dura, the boy was again anæsthetized, the wound reopened, and the dura incised. A very profuse hemorrhage followed, which could only be controlled by tight packing with gauze. The patient recovered from this operation after a long and complicated convalescence. Finally, he was left with a large defect of the skull, there was a depression so large and deep that the greater part of the closed fist could be inserted into it. The deformity was a very unsightly one, and the parents of the child were anxious to have something done to remedy it. On August 26th Dr. Elsberg made a large flap over the defect in the skull, turned down the skin, and inserted an aluminum plate of his own design. The result was a very satisfactory one. The wound was entirely closed, and healed by primary union, the boy was discharged cured on September 21.

The splint employed in this case was made of aluminum, which can be cut into the shape desired without trouble. The plate has a number of arms which can be cut off at different

lengths to fit into the irregular defect. The ends of the arms are split longitudinally for a short distance, and one part of the arm then bent downward. The entire plate is then bent to conform to the general shape of the skull. When in place, one part of the extremity of the arm rests on the outer surface of the skull along the edge of the defect, the other part rests against the cut edge of the skull along the margins of the defect. The plate is kept in position by a few catgut sutures which attach the horizontal part of the extremity of each arm to the periosteum.

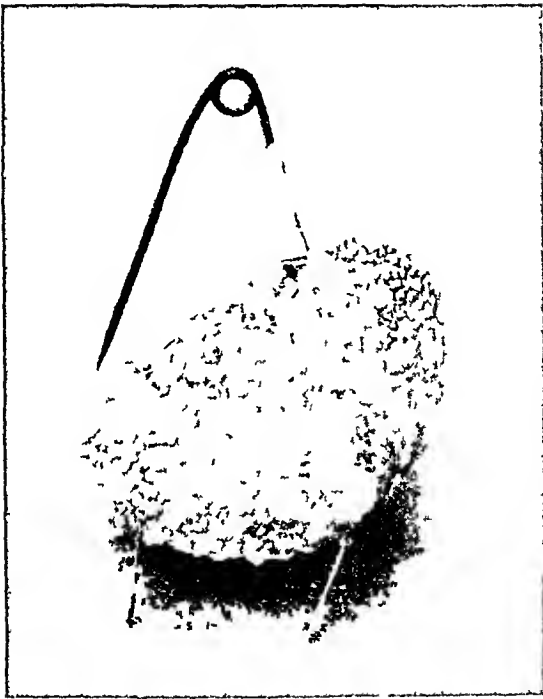
The advantages of this plate are the following. It forms a perfect arch, and the more pressure is put upon the arch from the outside, the firmer and stronger it becomes. It remains in place and makes a firm support,—bridging over the defect of the skull. It is easily made, easily inserted, and can be bent into any shape desired. It has none of the faults of plates which rest on the outside of the skull and are apt to shift their position, or of plates put inside of the bones, which rest directly upon the dura or the brain.

DR LILIENTHAL said he could corroborate Dr. Elsberg's statement in regard to the enormous size of the opening left in the skull at the time of operation. The defect was very marked, and the splint certainly did excellent work in this particular case.

#### VESICAL CALCULUS CONTAINING AN OPENED SAFETY-PIN AS A NUCLEUS

DR ALEXANDER B. JOHNSON presented a male, 17 years old, a deaf mute. When he was admitted to the hospital on December 26, 1907, he gave a history of indefinite duration, complaining of painful and frequent urination, with intense spasms of pain at the end of the act. His urine was cloudy, sometimes bloody, and during the past ten weeks all his symptoms had been aggravated. An X-ray picture showed the presence of a large calculus in the bladder. The stone was removed by a suprapubic incision with some difficulty, since the limb of a large safety-pin was imbedded in the centre of the calculus, while the other end, with the pointed extremity of the pin, projected into the cavity of the bladder. The pin was broken during its extraction. The stone weighed 717 grains (Fig. 3). The bladder was the seat of an intense cystitis. It was sutured with two rows of fine chromic gut, mattress stitches being used in the first layer, and continuous sutures in the second. The external wound was drained with a

FIG 3



Vesical calculus having as its nucleus an open "safety pin"



rubber tube extending into the space of Retzius. At the end of a week there was slight leakage, which soon ceased when the patient resumed the erect position.

At the present time, 22 days after the operation, the supra-pubic wound was healed and only a slight cystitis remained. The patient had never stated for what purpose he introduced the safety-pin into his urethra, nor would he acknowledge that he had even seen that particular safety-pin before. Inasmuch as it must have been introduced closed, but was found opened in the bladder, we must either assume that the muscular contractions of the bladder wall opened it, or that it was opened in the deeper part of the urethra by the patient himself in his efforts to extract it, and that it found its way into the bladder in the open condition.

DR HOWARD LILIENTHAL said the probabilities were that the pin was introduced into the urethra closed with the point towards the meatus, and that after it had gotten beyond the boy's reach it had been opened by his efforts to extract it. Then it was either pushed back into the bladder, or worked its way in. The speaker said he had recently seen the statement that if an open safety-pin was swallowed, it would almost uniformly remain in that position in which it had been swallowed and work itself out in that way, and that such a pin would usually pass through the stomach and intestines easier than an ordinary pin would.

DR JOHNSON thought it probable that the boy had inserted the pin closed, with the lock outwards. When it passed into the deep urethra he had probably made desperate efforts to push it out, resulting in the opening of the pin, and then it had worked its way into the bladder. The speaker said he had seen quite a number of cases of foreign bodies in the male bladder, among them bits of chewing gum and fragments of catheters.

#### PYONEPHROSIS OF A CONGENITALLY MISPLACED KIDNEY NEPHRECTOMY

DR ALEXANDER B JOHNSON presented a boy, 12 years of age, who was admitted to the hospital on September 22, 1906. For the previous two months he had suffered greatly with pain in the region of the umbilicus, and he stated that he was never free from pain unless lying down. He frequently had attacks of vomiting shortly after eating, and for five weeks prior to admission he had increased frequency of urination and a sharp pain at



the end of the penis after voiding urine The urine had become turbid

The abdomen was somewhat distended, with moderate tenderness to the right of the umbilicus No masses were palpable A rectal examination was negative, with the exception of slight tenderness anteriorly The urine contained many renal cells, a moderate amount of pus and a few red blood cells Temperature on admission, 101.8, respirations, 28, pulse, 108

Operation, September 22, 1906 An incision was made to the left of the median line, examination having revealed a mass about the size of a lemon just above the umbilicus on that side This was fairly hard and movable, and proved to be retroperitoneal in location The peritoneum was thereupon incised and separated from the mass, which was found to be a low, obliquely placed malformed kidney, with a dilated ureter A normally placed kidney was found on the right side

Upon removal of the malformed left kidney, its pelvis was found to contain two ounces of pus A sound passed through the ureter into the bladder detected no calculi A two-inch drain was introduced into the wound, the patient made an uneventful convalescence, and was discharged cured on October 26, 1906 The wound healed by primary union excepting for the drainage sinus, which closed by granulation

On section of the excised kidney, many pockets of pus were found Considerable good kidney tissue remained, however The pelvis and ureter were much dilated, with thickened walls A culture made from the kidney pus showed *Staphylococcus aureus* in pure growth

The blood supply of the kidney, both arteries and veins, was derived from the internal iliac vessels by short straight trunks The position of the misplaced kidney was in front of the left sacro-iliac joint The ureter was about three inches in length At the present writing, 18 months after the removal of the kidney, the boy was in good health

#### THE VALUE OF ENTEROSTOMY AND OF CONSERVATIVE OPERATIVE METHODS IN THE SURGICAL TREAT- MENT OF ACUTE INTESTINAL OBSTRUCTION

DR CHARLES A. ELSBERG read a paper with the above title for which see page 738

In connection with his paper, Dr Elsberg showed three patients upon whom he had operated by this method

DR F KAMMERER said he quite agreed with Dr Elsberg as to the advisability of enterostomy in a certain class of cases of intestinal obstruction, especially in chronic cases in which the condition was complicated by an acute crisis. The speaker said that, in his experience, cases of that character did very badly after even the very slightest operative interference, they were generally cases of carcinoma of the large intestine, and the patients were usually cachectic and in a mild chronic septic condition. The local conditions at operation were also against the patient. He referred to the at times enormous distention of the intestines, to the difficulty of preventing rupture of the serosa during manipulation, and under such circumstances he would be inclined to limit himself to a simple enterostomy as a primary measure.

In acute intestinal obstruction, however, the speaker said he did not quite agree with Dr Elsberg. Of course, one could understand how an enterostomy would afford permanent relief in certain cases, such, for example, in which the obstruction developed very soon after operation for an acute inflammatory condition and was in all probability due to mechanical conditions dependent upon inflammatory exudation and adhesions. That the latter were absorbed and frequently disappeared in the course of time was well demonstrated in the dense adhesions that were often observed surrounding an inflamed appendix, and of which no trace could be found at a subsequent operation. In cases of acute intestinal obstruction due to permanent mechanical conditions, in which no later relief of this kind could be expected, Dr Kammerer was in favor of always searching for the seat of obstruction and removing it, if possible. In such cases we were dealing with patients in a better physical condition, and a more prolonged operation was justifiable than in the cases of chronic obstruction with cachexia.

In the statistics quoted by Dr Elsberg, showing the relative infrequency of gangrene after obstruction, apparently there were included many cases in which the cause of the obstruction was found and relieved at the time of the primary operation. Many of these cases, however, had they been treated by a simple enterostomy without relieving the cause of the obstruction, would

have gone on to gangrene, and would have greatly increased the percentage of mortality from this source. The low rate of mortality from gangrene, computed by Dr. Elsberg, should therefore be revised. At all events it should not be quoted in favor of simple enterostomy in cases of acute intestinal obstruction.

DR. ELLSWORTH ELIOT, JR., thought that the indication for enterostomy depended largely upon the type and duration of the obstruction and the condition of the patient. If the case was seen early and the condition of the patient was good, he saw no reason why an attempt should not be made to determine the nature of the obstruction and relieve it. In several of the cases Dr. Elsberg had mentioned obstruction had followed the formation of adhesions, appearing several weeks after operation for acute appendicitis. In cases of that character, the speaker thought relief could safely be afforded by the separation of the adhesions if the operation were done within a few hours after the onset of the acute symptoms. He had had at least a half dozen of this character, in all of which recovery had been obtained by this means without resorting to enterostomy.

In cases of intestinal obstruction that were seen late, Dr. Eliot said he agreed with Dr. Elsberg as to the advisability of an enterostomy, irrespective of the type of the obstruction. Even here, however, if the condition of the patient would warrant a short exploration, he saw no reason why it should not be made to determine the presence or absence of necrosis. Such a type of obstruction might reasonably be inferred by the turbidity and odor of the peritoneal fluid. If the latter condition was found, it should be dealt with in the manner suggested by Dr. Elsberg.

The more favorable results of enterostomy to-day over those obtained a number of years ago were probably due to the fact that the operation was now done more quickly, speed being a very essential factor, and that a very much smaller opening was made than that advocated by the older surgeons, among them Treves. In speaking of the gratifying results of enterostomy in certain conditions, Dr. Eliot referred to a case of acute obstruction of several days' duration in a man 72 years old which was supposed to be due to a carcinoma of the large intestine, but upon opening the abdomen it was found to be due to a stricture from an old peritoneal band. This was divided, and at the same time a small opening was made in the transverse colon above the site of the

band through which a catheter was introduced for ten days. There was no subsequent development of the obstruction, and the fecal fistula closed promptly on the withdrawal of the catheter.

In speaking of enterostomy in connection with intussusception, Dr. Eliot said that several years ago he had had occasion to study this condition rather carefully, and he had found that in cases of intussusception, in infants under one year, the operation of enterostomy, *per se*, had not been followed by recovery in a single instance. Dr. Elsberg, therefore, could be excused for his unfortunate result in the case of intussusception he reported, in which the operation had been done quickly, and where reduction was satisfactorily accomplished. The result depended largely on the condition of the patient. Some two or three years ago, in a paper which he read before the American Surgical Association, the speaker reported a number of cases of intussusception, including two successive instances of operation during the same afternoon, one on a six-months-old infant, the other on a two-year-old child, and in both reduction was accomplished quickly and satisfactorily, the entire duration of each operation being less than 15 minutes. The two-year-old child was rickety and at the end of 72 hours died, the six-months-old infant was in good condition and promptly recovered.

Dr. Eliot believed that enterostomy in such cases was contraindicated.

DR. WILLY MEYER said that while the favorable statistics quoted by Dr. Elsberg might lead one to agree with him regarding the value of enterostomy as a conservative operative measure, yet the fact should not be overlooked that the result depended largely on the condition of the patient and the degree of intestinal distention. No general rule could be laid down in regard to the treatment of these cases. If the cases were seen early and the general condition was favorable, he was in favor of trying to find and relieve the seat of the obstruction at once, and personally, the speaker said, he was inclined to avoid an enterostomy in the ordinary intestinal operations if the patient's condition was such as to warrant its omission. One of the great dangers, confronting the narcotized patient, was fecal vomiting with aspiration. He wished to again call attention to the great advantages offered in such cases by the use of Kausch's œsophageal narcosis tube. If the tube were properly placed, the intestinal contents above the

seat of obstruction would run through the open pylorus into the stomach and thence through the tube outward into a pail beneath the operating table. Aspiration-pneumonia could thus be avoided, also the necessity of emptying the distended bowels through an incision during the operation, in order to be able to replace them.

DR L. W. HOTCHKISS thought that all would admit the value of the general principle of enterostomy in acute intestinal obstruction, and Dr. Elsbberg's paper had emphasized in a timely way the value of conservative operative methods in a class of cases where we were too apt to try and do too much. Certainly his results in the eleven cases reported in his paper were very striking. In the class of cases in which he applied it, it was apparently a life-saving measure, and it was quite possible that in many of these borderline cases we too often attempted to relieve everything and sometimes no doubt at the expense of the patient.

DR JOSEPH A. BLAKE said a distinction should be made between cases of strangulation ileus and those due to obturation and compression. In the first class, an enterostomy alone was not sufficient, while in those due to obturation or compression an enterostomy might in many instances suffice. Many of the cases of post-operative ileus were not caused by any very marked compression of the intestine, but were rather the result of a disturbance of the function and motility of the gut, and under those conditions even a slight degree of constipation might produce kinking. In dealing with such cases, careful lavage of the stomach and lower bowel might in many instances render even enterostomy unnecessary.

Too much stress, Dr. Blake said, should not be laid on the rôle played by enterostomy in cases where the obstruction was already relieved, for under those conditions it was questionable whether the enterostomy alone was responsible for the patient's recovery. In cases of chronic obstruction, with an acute exacerbation, enterostomy was advisable. Dr. Charles L. Gibson, some years ago, looked up the statistics of a large number of cases of gangrenous hernia, and his figures showed that immediate resection gave only about one-half the mortality of an artificial anus.

DR ELSBERG, in closing, said that in the list of cases he reported there were quite a number of patients with ileus due to strangulation or obturation. Not all of them were treated by enterostomy alone, in quite a number the obstruction was imme-

diately found and relieved In his conclusions he had stated that an enterostomy should be done if at the time of opening the abdomen the patient's condition was not good and the obstruction was not at once found and easily relieved

Several of the speakers, in discussing his paper, had referred to the condition of the patient It was often very difficult to judge of the condition of the patient—whether he could stand the operation or not, that factor was a rather uncertain one After considerable trouble to find and relieve the obstruction, and to complete what one considered a very successful operation, the patient frequently died This happened in from 50 to 80 per cent of cases in the hands of surgeons all over the world The results would be better if we did the operation in two stages, at first simply relieving the acute symptoms, rather than going ahead and completing the operation in the face of unknown difficulties

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*Stated Meeting, Held February 12, 1908*

The Vice-President, DR ELLSWORTH ELIOT, JR, in the Chair

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#### PERFORATING GASTRIC ULCER

DR JOHN A HARTWELL presented a man 31 years old, who was admitted to Bellevue Hospital on January 12, 1908 His family history was unimportant, with the exception of the fact that his father died of intestinal obstruction of unknown cause The patient stated that he indulged in periodical sprees, usually drinking beer He was a heavy smoker no drug habit He had an attack of gonorrhœa ten years ago denied syphilis He had an attack of rheumatism six years ago, and had had occasional attacks of influenza and bronchitis

**Gastric History** The patient stated he never had any previous stomach trouble excepting one slight attack of indigestion some years ago One week before admission he began to be troubled with gastric disturbance, nausea and vomiting This continued for five days, during which time the patient felt indisposed, but he was able to be about and eat a little This had followed a rather free drinking bout, which was assigned as its cause The night prior to admission the patient was taken with severe pain in the abdomen, and vomited three times The

vomit was brownish in color and watery, but never contained any blood. He took some calomel, and felt better in the morning. After a movement of the bowels he had another attack of vomiting, with intense stabbing pain in the epigastrium. This pain was so severe that an ambulance was called and the patient taken to Bellevue Hospital.

On admission, his temperature was 98.8, pulse, 62, respirations, 32, leucocyte count, 20,000. The patient was well nourished and his general appearance was healthy, although he showed evidence of severe suffering. The respiration was almost entirely thoracic in type, and he lay on his back or partially on the right side, with the thighs well flexed on the abdomen. The abdominal muscles were rigid and scaphoid abdomen was present. Palpation revealed a very general tenderness, rather more marked in the right hypochondriac and umbilical regions. The percussion note was tympanitic throughout, and the liver dulness was considerably obscured by free air in the peritoneal cavity. No actual masses could be felt, though the resistance over the area of tenderness was more marked than elsewhere. A probable diagnosis of acute perforating appendicitis, with a high-placed appendix, was made, and an operation was done about eighteen hours after the onset of the attack on January 12.

Incision was made through the right rectus muscle, one inch from the median line above the umbilicus. The peritoneum was opened, the appendix located, and was found congested, though not adherent. It evidently was not sufficiently diseased to be the cause of the symptoms. Appendectomy was performed without inverting the stump. The gall-bladder and ducts were explored, and found normal, as was also the right kidney. The transverse colon was found to be elongated and drawn downward toward the right iliac fossa. It was adherent to the ascending colon by a broad band of adhesions. These were ligated and the colon straightened. The stomach was then exposed and a round ulcer found on its anterior surface, near the pylorus. An indurated area, nearly one half inch in thickness and two inches or more in diameter was found on the lesser curvature, near the pylorus, riding over the anterior and posterior surfaces. In the centre of this, on the anterior wall, the ulcer had perforated. Fluid and gas were escaping in small quantities. The perforation was closed with a purse-string suture, re-inforced by several

Lembert sutures The transverse colon was so adherent that its convex border was incorporated into the outer row of these sutures The pylorus was examined by invagination, and found to be very much constricted A posterior gastro-enterostomy was therefore performed by the "no loop" method with clamps and sutures A large cigarette drain was inserted down to the site of the ulcer, and the abdominal wound closed in layers The patient was returned to the ward in good condition, and made an entirely uneventful recovery The wound healed *per primam* excepting at the track of the drain, through which there was a slight serous discharge for a week The temperature rose to 101 and the pulse to 118 on the day following the operation Four days later they became normal, and remained so thereafter During the first thirty-six hours after the operation the patient received nothing in the way of nourishment, and was given salt solution by rectum Forty-eight hours after the operation he retained a small quantity of water by mouth, but promptly vomited one ounce of malted milk, and had a considerable amount of gastric pain He was given nothing further by mouth until the following day, when he received a small amount of peptonized milk, which he retained without trouble This was continued in increasing quantities, other food being added to it until on the sixth day he was receiving a rather generous diet The case was presented because of the total absence of symptoms from an ulcer of evidently long standing which involved such a considerable extent of the stomach wall near the pylorus

SPINDLE-CELLED SARCOMA OF THE STERNUM SUCCESS-  
FULLY TREATED WITH THE MIXED TOXINS OF  
ERYSIPELAS AND BACILLUS PRODIGIOSUS

DR WILLIAM B COLEY presented a woman, 38 years old, whose mother died of tumor of the brain twelve years ago The patient had always enjoyed good health until June, 1906, when she noticed an enlargement of the upper portion of the sternum, especially marked over the sternoclavicular joint on the right side This slowly increased in size up to December, 1906, when Dr Coley first saw her in consultation with Dr David John of Yonkers, N Y At that time her general condition was fair There was a tumor the size of half an egg in the upper portion of the sternum, extending to the right over the sternoclavicular articulation In consistence it was moderately soft, but not fluctu-



ating The patient gave no tuberculous personal history, although several uncles and aunts had died of tuberculosis

Soon after the tumor was discovered, Dr John had put the patient upon potassium iodide, but this treatment had no influence upon the growth Dr Coley advised an exploratory incision to confirm the clinical diagnosis of sarcoma This was done by Dr John on December 29, 1906, and the specimen removed was examined by Dr James Ewing of Cornell University, and Drs B H Buxton and Martha Tracy of the Loomis Laboratory, who pronounced it spindle-celled sarcoma

On January 6, 1907, the use of the mixed toxins was begun by Dr John under Dr Coley's direction, the initial dose being one-half minim injected into the neighborhood of the tumor This was followed by a chill and a moderate rise of temperature The treatment was repeated every other day in gradually increasing doses, and by the end of January the dose had reached two and a half minims, which was followed by a temperature of 103 to 104 After twenty injections had been given, the tumor had diminished considerably in size, and treatment was suspended for two weeks

Examination on February 25 showed the tumor to have again markedly increased in size, and a small lump was felt beneath the sternomastoid muscle This increased in size for the first month The injections were resumed and continued every other day in gradually increased doses until the end of March Then the injections were given at varying intervals, being discontinued again for a brief period in July, as the patient complained of very severe headaches, sleeplessness and depression She received her last injection in July, 1907 The tumors in the neck above the clavicle increased markedly in size until the dose had become very large, when they began to slowly decrease in size About the middle of June, some breaking down was noticed in the sternal tumor, followed by a slight discharge of necrotic tumor tissue, which continued for six months, when it ceased entirely The highest dose, reached very gradually, was thirty minims This caused a very marked reaction, and severe prostration Most of the injections were made outside of the limits of the tumors The patient had received no treatment now for more than seven months The tumors continued to slowly diminish in size after the cessation of the treatment, and

FIG 4



Amniotic constrictions middle and ring fingers of right hand

FIG 5



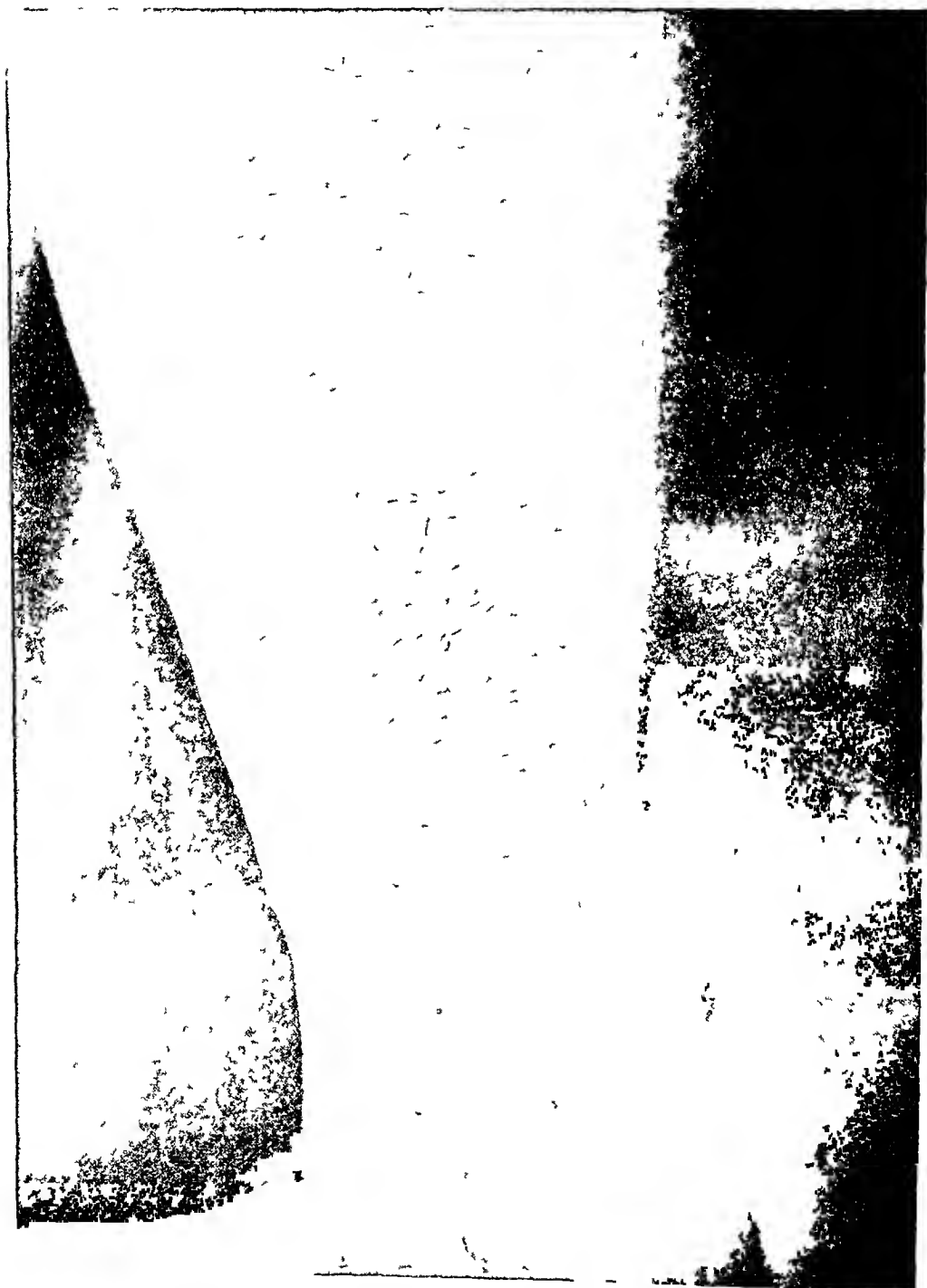
Amniotic constrictions, right foot

FIG 6



Amniotic constrictions and syndactyly of left foot

FIG 7



Amniotic constriction of leg

her general health improved. At present, both the tumor in the neck and that of the sternum had practically entirely disappeared, and he did not believe that any further treatment would be necessary to effect a permanent cure.

Dr. Coley said it was worthy of special note that this patient had received the largest dose of the stronger preparation toxins within his knowledge, namely, thirty minims. The tumors continued to disappear long after the treatment was discontinued, a phenomenon that he had observed in several other cases.

#### INTERSCAPULO-THORACIC AMPUTATION FOR SARCOMA RECURRENCE SUCCESSFULLY TREATED WITH MIXED TOXINS

DR. WILLIAM B. COLEY presented a girl 16 years old, who had been the subject of a sarcoma of the right shoulder-joint which was first noticed in January, 1907. She was treated for three weeks with injections of the mixed toxins, with some improvement at first, but later the tumor increased in size, and on account of the extent of the growth an interscapulo-thoracic amputation was done early last July. The subclavian vessels were partly filled with sarcomatous thrombi. There was a recurrence within three months, and in early October, 1907, the toxins were again resorted to and kept up until December 23. Under this treatment the evidences of recurrence had disappeared, and the patient had gained sixteen pounds in weight. This patient was presented before the New York Surgical Society in December, 1907.

#### CONGENITAL DEFORMITY OF HAND AND FEET

DR. WILLY MEYER presented a man, 22 years old, a ship's steward by occupation, with deformities of the fingers of the right hand and toes of both feet and one leg (see Figs. 4, 5, 6, and 7). These were of congenital origin and due to amniotic constrictions. The patient entered the hospital suffering from an ulcer of the sole of the right foot, which, however, was not perforating. In its immediate neighborhood and on the dorsum of the same foot, just above the ankle, he had an anæsthetic zone about the size of a silver dollar. In this area he did not feel pain, and could not distinguish heat from cold. Above the ankles there was a garter-like constriction of the leg.

The patient was being treated by Bier's hyperæmic method in the hope of inducing the ulcer to heal by improving the circulation. He had been much benefited in the two weeks of his stay at the hospital, the ulcer being almost closed.

#### PROLAPSE OF THE CÆCUM AFTER APPENDICOSTOMY

DR. WILLY MEYER presented a man, 24 years old, who entered the German Hospital in the Fall of 1904 suffering from amoebic dysentery which he had contracted in Egypt. As he had been sick for some time and had been unsuccessfully treated by various methods of internal medication, it was decided to do an appendicostomy through which opening proper lavage of the lower bowel could be carried out. The operation was done through an intermuscular incision, the cæcum being pulled up to the peritoneum and the rather voluminous appendix was brought straight out through the abdominal wound. He was then treated for several months at the hospital, the bowel being regularly washed out through the appendicostomy wound with a one per cent solution of muriate of quinine. When the patient left the hospital he was instructed how to introduce the catheter and continue the treatment, which had to be kept up for about a year before his diarrhoea ceased and his stools became normal.

When the patient again came to the hospital to have his appendicostomy wound closed, it was found that he had a prolapse of the cæcum, which had forced its way through the appendicostomy-fistula, surely an exceptional case (see Fig 8). Dr. Meyer intends to excise the prolapse and suture the bowel.

#### FIBRO-OSTEOMA OF THE HUMERUS

DR. ELLSWORTH ELIOT, JR., presented a man of 18 years, who was admitted to the Presbyterian Hospital in June, 1900, with the history that six weeks prior to admission he had fallen and struck his right shoulder. This was followed by some swelling, and the patient was brought to the hospital.

There were no evidences of fracture or dislocation. On the anterior and inner aspect of the right humerus there was a hard, fusiform mass about two inches wide and three inches long attached to the upper end of the bone. The circumference of the arm at its most prominent point exceeded that of the opposite arm by two and a half inches. The growth was supposed to be

FIG 8



Prolapse of cæcum through appendicostomy fistula





a sarcoma, and an operation was advised, with the suggestion that an amputation at the shoulder or at a point even higher up might be found necessary. The boy's father consented to an operation, but refused to permit an amputation. A four-inch vertical incision was thereupon made, exposing the tumor. There was no satisfactory line of demarcation between it and the humerus, and its appearance resembled sarcoma rather than osteoma. It was removed with the chisel, leaving a thin plate of bone externally and posteriorly. This shell of bone that remained was so thin that near the end of the operation a transverse fracture occurred at the anatomical neck, which subsequently united without trouble, and without displacement.

The tumor, upon microscopical examination, proved to be a fibro-osteoma. The case is chiefly of interest because of the fact that in spite of the proximity of the bony tumor to the epiphyseal line, its removal did not interfere with the growth of the limb, nor with the subsequent restoration and function of the bone.

#### RIGHT-SIDED URETER CALCULUS COMPLICATING CHRONIC APPENDICITIS

DR FORBES HAWKES presented a man 28 years old, upon whom Dr Hawkes had first operated on March 6, 1906, for intra-hepatic calculi which were located with the X-ray. The calculi had been removed in two stages, and the patient had made an excellent recovery, his old symptoms associated with jaundice having entirely disappeared.

After leaving the hospital, on April 5, 1906, he felt well for about two months. Then he was seized with a sudden sharp pain in the right hypochondriac region, with inability to urinate. Three weeks later he had a similar attack. He then remained perfectly well and free from pain for fifteen months. Subsequently he had similar attacks, but the pain had been lower down. The urinary symptoms, however, had not been so prominent. On admission to the Presbyterian Hospital, in the service of Dr A J McCosh, the patient presented marked right mid-rectal abdominal rigidity, with distinct superficial tenderness. There was no elevation of temperature nor increase in the pulse rate. The urine contained a trace of blood. The X-ray plate showed a calculus in the pelvic portion of the right ureter. A diagnosis of complicating chronic appendicitis was made on account of the superficial tenderness and the rigidity.

The patient was operated on December 12, 1907, by Dr Hawkes, who removed the appendix through a low intermuscular incision. It was found to be the seat of a marked chronic inflammation. The peritoneum was then reflected from the abdominal wall below and to the outer side, until the ureteral calculus was reached. The ureter, together with the calculus, was then raised between the thumb and index finger, a longitudinal incision was made in the ureter, and the calculus removed. The incision in the ureter was then closed by interrupted chromic catgut sutures involving all the coats of the ureter excepting the mucous membrane. A small rubber tissue and gauze cigarette drain was placed retroperitoneally down to the site of the ureter suture and the peritoneum was closed.

The patient made an uneventful recovery, and there was no leakage from the ureter wound. He had since remained well.

#### RUPTURE OF THE LONG HEAD OF THE BICEPS MUSCLE AT ITS GLENOID ORIGIN

DR FORBES HAWKES presented a man 38 years old, who had ruptured the long head of his biceps muscle by muscular action, tearing it away at its glenoid origin. Examination showed a bulging in the region of the belly of the right biceps, with a small sulcus above and to the right side. There was marked weakness on flexing the elbow. At the time of operation, on January 29, 1907, the entire long head of the biceps was found in the middle of the arm, curled upon itself. As it was not considered advisable to open the shoulder-joint in order to re-attach the tendon at its glenoid origin, it was grafted into the short head just below the coracoid process. The functional result of the operation was excellent. The patient said that his arm was as useful as ever, and he had returned to his work as an expressman.

#### TUBERCULOSIS OF THE TIBIOTARSAL JOINT

DR WILLY MEYER presented a girl 21 months old, who came under his care in July, 1906, for tuberculosis of the left tibiotalar joint, with sinus formation. An X-ray picture was taken, which showed that much of the astragalus was destroyed. After a few months of hyperæmic treatment at the hands of the child's mother, who had been thoroughly instructed, sickness

amongst the other children prevented her from further proper attendance. Therefore the child was admitted to the hospital, and on December 27, 1906, the joint was resected by the Koenig method. The astragalus, which was thoroughly diseased, was removed, and the synovial membrane carefully extirpated, as well as the tuberculous granulating tissue surrounding the peroneal tendons. The joint was then filled with iodoform fluid prepared according to Mosetig, which hardened rather quickly.

The child's convalescence was retarded by an attack of scarlet fever, but she eventually made an excellent recovery, with very slight shortening. She walks with a proper shoe for the last six months, the foot being in good position.

#### HABITUAL DISLOCATION OF SHOULDER

DR WILLY MEYER presented a man 31 years old, who was admitted to the German Hospital in June, 1906, for an habitual dislocation of the left shoulder, which had resulted from a fall on the hand about four years ago.

In operating on this case, Dr Meyer said he made an incision down to the capsule between the pectoralis major and the deltoid, and laterally incised the acromic origin of the deltoid for a distance of an inch and a half. This gave a good exposure, and brought out the anterior portion of the capsule very well, especially by pulling the coracobrachialis muscle inward. The joint itself was not opened. The capsule, which was not very much distended, was inverted toward the inner side, and stitched with a longitudinal continuous chromicized catgut suture.

Dr Meyer said he had found this method of shortening the capsule of the joint an excellent procedure. Since the operation in this case, which was done on June 18, 1906, the man had had no further dislocation of the shoulder.

#### EXCISION OF THE RECTUM FOR CARCINOMA

DR WILLY MEYER presented two patients. The first patient was a man 49 years old, who was admitted to the German Hospital on December 1, 1906, with an ulcerating tumor just above the anus, its walls were elevated, and its upper end was just within reach of the finger. The operation done was that of Witzell-Hoffmann, combined with Gersuny's method, with the

patient in the knee-elbow position After excision and disarticulation of the os coccyx, the presacral space was entered and the rectum freed The sphincteric ring could not be spared The median and inferior hemorrhoidal artery were tied primarily, thus reducing hemorrhage markedly As in all cases of this kind, the peritoneal cavity was widely opened and after tying the mesosigmoid in portions, the gut could be well pulled down Gauze-tampons having been placed in the peritoneal incision, the muscular coat of the gut was circularly incised and the mucous cylinder tied with catgut Then a clamp was placed distally and the gut cut across, its lower end being stitched about three quarters of an inch below the level of the skin after having been turned for  $180^{\circ}$  according to Gersuny The upper portion of the wound was sutured, the lower portion tamponed, good recovery To-day the patient keeps himself clean with the help of irrigations every morning, the turning of the stump did not provide for sphincteric action He has gained over thirty pounds in weight

The second case shown by Dr Meyer was a woman, 30 years old, who was operated on three and a half years ago by the Witzell-Hoffmann method There the stumps had not been fastened in the wound after amputation and retracted behind the sacrum, a condition which later on necessitated a secondary operation on account of a cicatricial stricture To-day this patient too is in excellent condition By regular bowel irrigation every morning she remains clean during the remainder of the day

#### EXCISION OF THE INFERIOR MAXILLA FOR CANCER

DR GEORGE D STEWART presented a man, 47 years old, who was admitted to St Vincent's Hospital on December 13, 1907 His family and previous history was negative Patient drinks moderately, smokes pipe excessively, always holds pipe on the left side of the mouth Careless as to mouth sanitation Appetite good, bowels regular, no history of injury or of venereal disease

Patient had several attacks of neuralgia at intervals for the last seven years About 11 weeks before admission he began to have trouble with left lower bicuspid and molar teeth, there was pain and swelling over the gums appeared Three weeks later had three teeth extracted About a week after extraction,

swelling increased, was painless, and the swollen gums bled easily. Went to the Dispensary and on December 8th a small piece of soft tissue was removed for diagnosis.

Examination on admission showed ulceration and swelling of the gums on left side lower jaw, slightly tender. Surface of swelling pale, skin over tumor not involved, a small gland palpable behind angle jaw.

Decemer 28, 1907 —An operation was performed through an incision, beginning behind the vertical ramus of the jaw, running downward, parallel to this ramus, to the hyoid bone, thence forward slightly beyond the symphysis menti. A flap was lifted and an enlarged gland found at the bifurcation of the carotid, was removed. Through this incision the external carotid artery was permanently ligated and a temporary ligature was applied to the corresponding vessel on the opposite side, making the operation almost bloodless. The dissection was made as complete as possible before the mucous membrane of the mouth was invaded. Later the bone was removed above the angle and slightly beyond the symphysis menti, the corresponding side of the tongue was involved and a part of it had to be removed together with the anterior pillar of the fauces. The operation was very extensive and the patient for several days could not swallow and had to be nourished by enema. After the operation, the portion of the jaw remaining, on the advice of Dr. Dunning of the New York Dental Infirmary, was wired to the upper jaw of that side, to prevent the displacement which would follow healing and contraction, and with the hope that it might later serve in some slight way to assist in mastication. The raw tissues on the inner side of the cheek were allowed in this case to adhere to the tongue, but Dr. Stewart states that in future cases of this sort he proposes to pack the wound during healing with sufficient gauze to fairly preserve the normal contour of the cheek and suggests that after healing some sort of celluloid or gutta percha splint might be worn. Another procedure which Dr. Stewart has found useful in operations of the mouth is the use of a rubber obturator made from a piece of ordinary sheet rubber, the rubber dam of the dentist, or a piece of light Esmarch bandage. Following removal of the superior maxilla, for instance, a properly shaped piece of rubber is stitched mesially to the cut edge of the palate, laterally to the cut edge of the buccal mucous

membrane The packing may be both placed and removed through the anterior naris on the diseased side The rubber obturator not only renders the packing more effective but prevents its dislodgement by the patient's tongue during recovery from anæsthesia and afterwards The stitches may be so placed that when it is desired to remove the rubber, by cutting at one point on either side the whole line of suture may be removed This manœuvre is of course most useful in the cases mentioned, removal of the upper jaw, but it may be applied where there is extensive loss of mucous membrane following any mouth operation

This case was presented to emphasize the following points (1) The value of temporary ligatures, (2) the importance of keeping the remaining fragment of lower jaw properly apposed to the superior maxilla, (3) to suggest the use of the rubber obturator, (4) to propose an attempt to avoid the subsequent deformity

DR STEWART, in reply to a question as to whether the wiring of the fragment of the lower jaw to the upper was only a temporary expedient or was intended to be permanent, said the wiring was only to be left there until the tissues had ceased to contract, otherwise, the right lower maxilla would be drawn toward the operative side He had instructed the patient to make an effort to keep as much control over the remains of his lower jaw as possible, and to use it in mastication

#### CARCINOMA OF THE CHEEK NO RECURRENCE AFTER THIRTEEN YEARS

DR GEORGE D STEWART presented a man 69 years old, who was operated upon by Dr Stewart thirteen years ago for carcinoma, which began in the cheek and invaded the lower jaw near the angle A section of the cheek was first excised Recurrence took place promptly invading the mucous membrane and the periosteum of the lower jaw At a second operation the body of the inferior maxilla was cut across about half way between the angle and symphysis and the smaller fragment was disarticulated

This patient remains cured after thirteen years, and is presented for this reason, and to show the marked and distressing deformity which has followed the operation

DR WILLIAM B COLEY, referring to the period of immunity after operations for sarcoma of the lower jaw, recalled three cases

in which the recurrence took place after five, ten and seventeen years, respectively. In the latter case the original operation was done by Dr D Hayes Agnew seventeen years ago for sarcoma, while the recurrent tumor was a carcinoma.

### COMPLETE THYROIDECTOMY

DR GEORGE D STEWART presented a girl 18 years old, who was admitted to St Vincent's Hospital on January 19, 1908, suffering from a tumor situated in front of the hyoid bone and the upper part of the thyroid cartilage. The tumor which was something over 1 inch in transverse and  $1\frac{1}{2}$  inch in vertical diameter had been noticeable since the patient was seven years old, had never given any symptoms, but had been increasing in size for the last two years. Because of its location it was thought probable that the tumor was a cyst of the thyroglossal duct.

January 25, 1908—Through a median incision to avoid scarring, the tumor was removed. It was easily isolated from the sides and below, and in these directions there appeared to be no important vascular connection. Above on either side a small vessel, which suggested the superior thyroid vein, was supplied to the tumor. There was no suggestion in the shape of lateral lobes. Taking into account these facts, it appeared to be almost certain that the tumor was not of the thyroid itself and that the preliminary diagnosis was correct. After the two vessels referred to were ligated the mass remained attached by a very slender pedicle in front of the hyoid bone, while manipulating the tumor with great care so as to completely remove the supposed persistent duct, the remaining attachment gave way. Fearing that it might represent the entire thyroid gland, the incision was extended downward in front of the trachea but no structure resembling the gland was found.

On microscopic examination, made by Dr Harlow Brooks, the tumor turns out to be of typical thyroid structure, the acini filled with colloid material, that is, the case is one of cystic goitre, and the tumor represents the thyroid gland.

Eighteen days have already elapsed since the operation. Patient's health remains perfectly good, suggesting the existence of an aberrant gland. It was suggested by Dr Rogers and others that the gland removed possessed little if any functional value.

DR JOHN ROGERS, in referring to the apparent absence of



thyroid gland in the case reported by Dr Stewart, and the possibility of symptoms developing in consequence, said that no definite time could be fixed for the development of these symptoms although they usually appeared soon. The longest period on record, so far as he knew, was three years. A comparative study of the thyroid gland in the lower animals was very interesting. The horse and the goat possessed two lateral lobes connected by a mere strand of fibrous tissue, while the fox terrier had a gland very similar to that in man and with a large isthmus.

The specimen shown by Dr Stewart represented the thyroglossal duct, and the inference to be drawn was that the case was one of two lateral lobes of the gland lying between the trachea and œsophagus, one on each side, with a persistent thyroglossal duct leading upward toward the foramen cœcum. The connection of this thyroglossal duct with one or both lateral lobes probably existed but was not noticed. Considerable thyroid tissue may exist in this duct in any part of its course. Here the remnant in front of and above the thyroid cartilage has undergone cystic degeneration. The lateral lobes probably lie, as in the horse, goat and sheep, between the trachea and œsophagus, and escaped observation in the absence of the isthmus. If they did not exist it is not reasonable to expect that the patient could

DR WILLY MEYER mentioned two cases of cyst of the thyroglossal duct that had come under his observation. In one concerning a man, there was a closed cyst which covered the anterior part of the neck and passed behind the hyoid bone, and its extirpation necessitated the removal of the anterior part of the bone. The other case was in a child, five years old, with a small fistula of the neck, which at times closed and then reopened, discharging the usual fluid. The child showed an apparent lack of development, and there was a regular slight evening rise of temperature. Upon operation, a retention cyst of the thyroglossal duct was found, which was grasped with forceps and entirely removed. The upper part of the sac again ran up beneath the hyoid, from where it could be nicely removed by pulling this bone up with a sharp bone-hook. Both patients made a good recovery.

#### HYPOSPADIAS

DR ALEXANDER B JOHNSON presented a boy of 16 years, who came under Dr Johnson's care about two months ago for

penile hypospadias The penis was curved to a marked degree, and in order to correct the deformity, the well-known operation of Beck was done The urethral orifice was dissected out, leaving a narrow skin border The ventral surface of the penis was then split, and the corpus spongiosum dissected free from the corpora cavernosa as far back as the bulb The glans penis was then perforated from behind forward with a knife, and the meatus urinarius established in its normal situation The urethra was then drawn through the slit in the glans and sutured to the edges of the new formed meatus The central wound in the skin was united with sutures The patient had to be catheterized for about a week after the operation The result of the operation was very satisfactory He still had slight curvature of the organ on erection, but this was gradually disappearing, and he was now able to urinate through the normal meatus with great comfort

#### THE OPERATIVE TREATMENT OF INTRACTABLE VOMITING, NOT DUE TO PYLORIC OBSTRUCTION NEUROSIS OF THE STOMACH

DR WILLY MEYER read a paper with the above title for which see page 730

DR JOHN B WALKER said he recently saw a woman, 55 years old, who came on here from the West complaining of gastric pain and vomiting She was supposed to have a gastric ulcer or growth, but upon opening the stomach, nothing was found She was assured that she had been relieved of her trouble, and within a month after the operation she was able to eat three meals a day without causing pain or vomiting, and she had gained about eight pounds in weight The case was apparently one of neurosis of the stomach

DR MEYER, in closing, said that contrary to the usual dictum laid down in the text-books, he believed that intractable cases of so-called neurosis of the stomach should be operated on After other methods of treatment had been ineffectually tried, a laparotomy was clearly indicated The surgeon should not be induced, however, by his failure to find anything in the stomach, to do a gastro-enterostomy, because that procedure, as experience had shown, made matters more serious A gastro-enterostomy should only be done when it was clearly indicated

## BULLET REMOVED FROM CRANIAL CAVITY

DR WILLY MEYER reported this case and showed the specimen

The patient was a man who was injured with a 32-calibre bullet on June 30, 1906. The wound of entrance was in the right temple, and the bullet evidently crossed both olfactory bulbs and injured both optic nerves, as there was total loss of smell and sight. The patient slowly recovered from his wound, and subsequently complained of severe headaches and frequent pains in the regions of the left temple. He had no convulsions.

A number of radiographs were taken by Dr E W Caldwell, which located the bullet on the left side of the skull, immediately behind the orbit and probably in the middle fossa. After consultation, an operation was decided on, and this was performed on July 1, 1907. The ordinary flap operation was done, with the help of Doyen's grip and Gigli's saw, similar to that for removal of the Gasserian ganglion. Upon turning back the flap, the dura was found to be very adherent to the bone, but could gradually be pushed off the base with gauze tampons held by clamps. The bullet was found in the middle fossa, as had been shown by the X-ray. It had worked its way into the larger wing of the sphenoid, and was adherent to the dura mater and the brain. It was removed, together with a few bone-splinters, and a small gauze drain, plus a rubber gutter, was inserted through the lower trephine opening, while a second rubber drain was inserted through one of the upper drill holes. The patient made an uninterrupted recovery from the operation, and left the hospital nine days later. The operation had relieved him from his headaches, although, of course, it had had no effect upon the loss of smell and sight.

DR E W CALDWELL, who had done the radiographic work in the case reported by Dr Meyer, said that the two plates exhibited gave a pretty good idea of the location of the bullet. The important thing was to determine whether it was within or without the cranial cavity. The stereoscope was of assistance in determining that point, and it was decided, after considerable study, that the bullet lay within the great wing of the sphenoid, where it was subsequently found.

## ROUND-CELLED SARCOMA OF THE DORSAL SPINE

DR VIRGIL P GIBNEY and DR WILLIAM B COLEY reported this case, and presented the pathological specimen

The patient was a married woman, 42 years old. She had had nine children, seven of whom were living. When she was admitted to the Hospital for Ruptured and Crippled, on November 29, 1907, she stated that her general health had always been fairly good, although she had had epilepsy in infancy. Her father had died of paralysis, her mother of old age.

In March, 1907, during the night, patient was suddenly taken with pain in the left shoulder, this lasted for two months, always being especially severe at night. In June the right shoulder began to be painful, the pain on this side being also more severe at night. The pains continued intermittently up to the present time, there has been moderate loss of weight, no night sweats, gradual failure in strength, the patient getting easily tired. She has had nothing but internal treatment. She was admitted from the Out-patient Department with the diagnosis of abscess from Pott's disease, December 2, 1907. She came to the hospital without apparatus, walked with difficulty, gait very unsteady, eyes normal, round shoulders of moderate degree. Outline of vertebræ indefinite due to boggy and swelling in mid-scapular region. Palpation shows a fairly symmetrical swelling 6 inches in diameter, projecting from 1-2 inches beyond the normal surfaces. The admission history states that there is "distinct fluctuation over a large area over vertebral border of left scapula, the size of the palm of the hand, superficial to and not communicating with the bone. There is a small area with fluctuation on the right side, half the size of a hen's egg, opposite the mid-dorsal region. Between these two areas of fluctuation there is a peculiar boggy. Slight tenderness over the spinous process of sixth and seventh dorsal vertebræ, slight pain in the back, no rigidity. Sensation in lower extremities is diminished slightly, especially on anterior surfaces, there is also slight loss of motor power, incontinence of urine for the past 48 hours combined with incontinence of feces, knee-jerks active. Dorsal flexion of all the toes to plantar irritation, ankle clonus not elicited." Fluctuating areas were aspirated four times, bright blood flowing rather freely at each aspiration.

After admission to the Hospital, more careful examination of the swelling together with the negative results of aspiration led to the conclusion that the woman was suffering from a highly vascular round-celled sarcoma, the soft tissues of which closely simulated fluctuation. This diagnosis was confirmed by exploratory incision done on December 6th. A vertical incision, 2 inches long, was made over the tumor in the back opposite the seventh and tenth dorsal vertebræ, 2 inches to the left of the median line. On pushing aside the fascia and muscles, a distinct tumor of dark red color, of the size of a small orange, was found attached to, and apparently originating in the vertebræ, the base of the tumor involving the sixth-tenth vertebræ. The tumor was exceedingly vascular and it was believed unwise to make any attempt to remove it, except a portion (about the size of a hickory nut) for pathological examination. Hemorrhage was very free, but was controlled by tight packing of the wound. December 8 the patient showed some shock following the operation, the paralysis of the lower extremities as well as bladder and rectum became complete. She complained of a great deal of pain in the back, and sitting half propped up with back rest, is the only position that gives her comfort.

#### Blood count

R b c	4,200,000	Lympho	31 per cent
W B c	11,000	Eosin	5 per cent
Hgbn	75 per cent	Transit	15 per cent
Pol	67 per cent	No nucleated reds	

Small doses of the mixed toxins were begun on the 8th,  $\frac{1}{4}$  m m doses were followed by no chill, but slight rise of temperature and pulse. The toxins were given in fractional doses for a few days, seven injections in all, but in view of the great weakness of the patient it was thought advisable to discontinue them.

Dr Jeffries' report (December 11, 1907) pronounced the growth a small round-celled sarcoma.

December 24.—The site of the incision became broken down and sloughing, a large bed-sore developed in sacral region, gangrene on both heels, marked respiratory distress, retention of urine and feces. The patient continued to decline steadily and died on January 2, 1908, one month after admission.



Sarcoma of the dorsal spine



The autopsy report by Dr Jeffries reads as follows

"A growth was attached to the spine and involved the first five dorsal vertebræ. A second growth was found beneath the left scapula. Over this second growth was a circular opening or ulceration of the skin about  $3\frac{1}{2}$  inches in diameter with the growth protruding through the opening. There was a marked dorsal angular curvature. No other superficial lesions were observed.

Upon removal of the sternum, the heart and pericardium were found to be normal. The right lung was normal, except for an abnormality of development, in that there was but one lobe, there being but slight indication of an attempt to divide off the lower lobe from the middle. No such indication was observed at the junction of the upper and middle lobes. The left lung had also but one lobe and here also there was apparently no effort to divide. In this lung was a tumor the size of a man's fist involving the upper and median aspect of the apex and involving also the bodies of the adjoining vertebræ. This growth had to be severed to remove the lung. The tumor then could be seen to involve the third, fourth and fifth dorsal vertebræ (Fig 9). It could be seen slightly protruding into the right pleural cavity but had left the pleura uninvolved. On the left side it followed along and between the ribs at that side. The last cervical and first dorsal vertebra were removed and after sawing through the bodies and processes of these bones the tumor was found protruding into the vertebral canal. This mass was about the diameter of the cord at this point and was 2 inches long.

The liver was enlarged and firm and was undergoing fatty degeneration and was in a state of moderate congestion. The kidneys were markedly enlarged and were undergoing fatty and parenchymatous degeneration, and as in the liver there was marked congestion. The spleen was not enlarged, was firm and plum colored. The pancreas was normal. No other growths were found."

In this case the duration of the disease from the first symptom to death was only nine months, the shortest span for a sarcoma of the spine in our own experience and, as far as our reading goes, of all reported cases.

The general condition of the patient was so bad and the



disease progressing so rapidly, that the toxins, at least in the doses that the patient could bear, had little or no effect

The reporters stated that they had observed one other case of sarcoma of the spine in which the condition at the time of the beginning of the treatment was more desperate than in the present case, although the disease was of slower growth. This was the case of a young man 20 years of age, with an enormous tumor involving the lower dorsal and upper lumbar vertebrae. The patient had lost about 50 pounds and the pressure upon the spine had caused total paralysis of the lower extremities, bladder and rectum. The diagnosis of round-celled sarcoma was confirmed by Dr. Harlow Brooks, pathologist of the Bellevue Hospital. Under four months' treatment with the mixed toxins of erysipelas and bacillus prodigiosus, at the Montefiore Home for Incurables, the patient entirely recovered and is now in perfect health, six years later. This patient was presented to the New York Surgical Society in 1907.

Dr. Coley has observed another case of spindle-celled sarcoma of the vertebra which recovered under the toxin treatment and was well when last heard from, ten years later. In this case there was no paralysis.

#### IRREDUCIBLE INGUINAL HERNIA COMPLICATING SARCOMA OF THE TESTIS

DR. WILLIAM B. COLEY showed a fresh specimen removed from a case where he had been called upon to operate for an irreducible inguinal hernia. He found a large omental hernia which upon operation was easily reduced. On looking into the scrotum he found a tumor which upon aspiration proved to contain blood. He made the clinical diagnosis of sarcoma and thereupon removed the tumor, which he regarded as either a round-celled sarcoma or possibly teratoma.

(Note) —The pathological examination proved the tumor to be a small round-celled sarcoma.

The patient has had no symptoms other than those of hernia.

# TRANSACTIONS

OF THE

## PHILADELPHIA ACADEMY OF SURGERY.

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*Stated Meeting, February 3, 1908*

The President, DR WILLIAM J TAYLOR, in the Chair

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### EXCISION OF THE CLAVICLE WITH PERFECT FUNCTIONAL RESULT

DR JAMES K YOUNG presented a girl, 11 years of age, who fell in the school yard on January 30, 1907, injuring the left knee. The following day she had a high temperature and great prostration which continued until four days later when she had a hemiplegia of the left side. The knee continued painful but there was no swelling until the end of six weeks, when it swelled suddenly and to a great degree. A small pustule formed on the anterior surface and was opened and drained by the attending physician, and a drainage-tube was inserted. A slough occurred over the left clavicle which extended until the central third of the bone was fully exposed. The lower part of the neck and face also became enormously swollen and for three or four days she could not move her head. Pieces of bone were discharged from the right side of the inferior maxilla within the mouth.

On July 11, 1907, she was admitted to the Polyclinic Hospital under the care of Dr Young. The pus discharging from the wounds at this time showed the presence of *Staphylococci pyogenes aureus*, and a diagnosis of osteomyelitis was made. On September 20th, 1907, the clavicle still being exposed and it being impossible to close the wound, the entire clavicle was removed subperiosteally. The specimen examined in the pathological laboratory of the Polyclinic by Dr James A Kelly, Pathologist, showed an acute suppurative condition of the medullary cavity and osseous structure. The proximal extremity of the right clavicle was also removed.

Both wounds healed by granulation, and the X-ray taken January 31, 1908 shows a regeneration of the clavicle. The functional use of the part is remarkable but corresponds with what has been described by other observers where after removal of the clavicle the function of the shoulder has not been materially changed.

#### MALIGNANT ULCER OF ORBIT

DR WARREN WALKER presented a woman, thirty-five years of age, who came to the surgical dispensary of the Episcopal Hospital for treatment in the first week of December, 1907, giving the following history: married for nineteen years, has three healthy children, has had two miscarriages during past year, smallpox at four and abscesses of neck following typhoid five years ago.

*Present condition* began eighteen months ago with a small sore at left inner canthus which gradually increased in size. There was a clear watery discharge, no blood. The growth has within the past three months ulcerated into the nasal cavity and destroyed the muscles on the inner side of the eyeball. She has no pain but suffers from severe headaches. She was put on K I and inunctions of mercury, and the wound appeared to be slowly granulating when she developed a nephritis and treatment had to be stopped.

#### NON-ABSORBABLE LIGATURES AND SUTURES

DR OSCAR H. ALLIS read a paper entitled *The Non-absorbable Ligature and Suture*, for which see page 758.

#### GERMAN HOSPITAL SURGICAL CLINICS

DR JOHN B. DEEVER read a "Report of the Saturday Surgical Clinics for Students at the German Hospital during 1906-07," for which see page 761.

#### FRACTURE OF THE PROXIMAL END OF THE FIFTH METATARSAL BONE

DR HENRY R. WHARTON reported the following cases:

CASE I—W. A. G., aged 45 years, in jumping from a wagon in a runaway landed upon his right foot and found he had pain and difficulty in walking. On the third day after the accident, and as the foot was still painful and interfered with walking,

he consulted Dr Wharton, who found on examination that there was marked swelling over the proximal end of the fifth metatarsal bone, and great tenderness upon pressure of this portion of the bone. An X-ray examination showed that there was a fracture through the proximal end of the bone. A plaster-of-Paris bandage was applied for two weeks, and upon its removal, as the tenderness had disappeared, strapping and a bandage were applied, and he was able to walk comfortably with the aid of a cane. Two weeks later he was able to discard all dressing and walk without difficulty.

CASE II—E B, aged 10 years, while skating upon roller skates ran into the curbing and fell, twisting her foot. She immediately experienced pain in the outer portion of left foot and walked with great discomfort. Dr Wharton saw her within an hour of the accident, and found a distinct swelling over the proximal end of the fifth metatarsal bone, this region was also extremely tender upon pressure. An X-ray examination on the following day showed a fracture passing through the proximal extremity of the bone. A plaster-of-Paris bandage was applied for two weeks, and upon its removal strapping and a bandage were applied, and the patient walked without difficulty.

CASE III—J C, aged 10 years, received a wrench of the foot while playing foot ball. He applied to the Dispensary of the Children's Hospital on the following day, complaining of pain in right foot, and difficulty in walking. Upon examination there appeared swelling of the tissues, and tenderness on pressure over the proximal end of the fifth metatarsal bone of the right foot. From the symptoms presented, which were exactly similar to the two cases reported above, Dr Wharton thinks he had the same variety of fracture. Dr Wharton further remarked that fracture of the shaft of the metatarsal bone is not an uncommon accident, and is said to be most common in the first and fifth metatarsal bones. The special variety of fracture reported in the above cases, the accurate diagnosis of which is impossible without the aid of an X-ray examination, does not seem to have been described by surgical writers. Hamilton speaks of fracture of the first and fifth metatarsal bones as most common, but makes no mention of fracture of the proximal end of the bone. Scudder mentions the greater susceptibility to fracture in the first and fifth metatarsal bones, and shows a skiagraph of a transverse fracture of the fifth

metatarsal bone near its proximal extremity Von Bergmann mentions a condition formerly described as tumor of the foot which was not uncommon in soldiers who made long marches carrying heavy weights Bruthaupt, Schentze, Kocher and others, with the aid of X-ray examinations, have shown that this condition is usually due to a fracture of the second or third metatarsal bone It is probable that the systematic X-ray examination which is now so generally employed in fractures, will show that it is a comparatively frequent injury

Fracture of this portion of the bone is probably of the nature of a sprain fracture, the fragments being separated by the ligamentous slips from the dorsal or plantar ligaments which attach it to the cuboid Displacement of the fragments seems slight

The treatment which seems most satisfactory is the application of a plaster-of-Paris dressing for a few weeks, or firm strapping and a bandage, which is followed by good use of the foot in from three to four weeks

DR JAMES K YOUNG wished to place on record a case in which union did not occur This was verified by X-ray examination In this case the distal end of the fifth metatarsal bone was first removed This did not relieve the metatarsalgia, and therefore the distal end of the fourth metatarsal bone was removed This gave some relief to the patient, and no other operative treatment was undertaken Dr Young simply wanted to show that the treatment advocated by Dr Wharton is not always satisfactory in producing union in fracture of the fifth metatarsal bone

#### MULTIPLE FRACTURE OF THE LOWER JAW TREATED WITH AN INTERDENTAL SPLINT

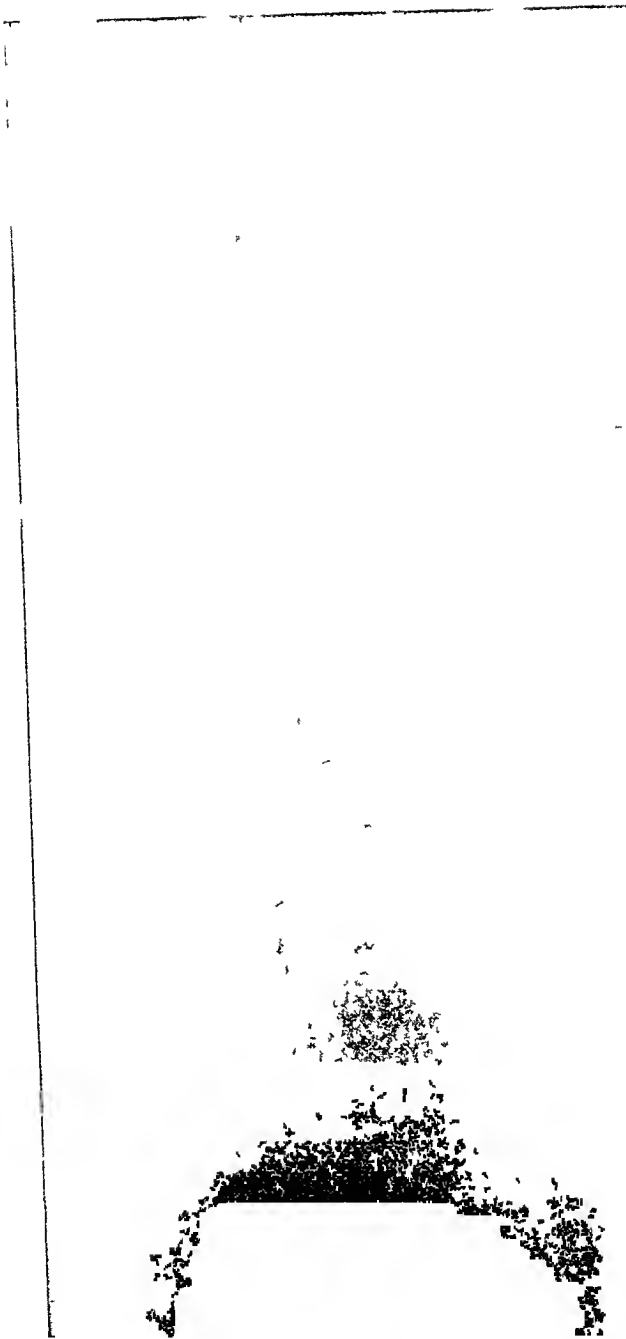
DR HENRY R WHARTON reported the case of a man, aged 24 years, who received an injury of the lower jaw probably by a blow from a blackjack He came under the operator's observation upon the following day, when it was found that there was a small lacerated wound of the left cheek which did not communicate with the mouth, and there were also two fractures of the body of the lower jaw, one on the left side just in front of the wisdom tooth, the other on the right side near the mental

FIG 1



X-ray showing fracture of proximal end of fifth metatarsal

FIG 2



X ray showing fracture of proximal end of fifth metatarsal

foramen The bone between these two lines of fracture was displaced downward, several teeth were loosened, and one had been knocked out near the fracture on the right side of the jaw. It was found by manipulation that the fragment could be replaced, but even with a compress and Barton's bandage it could not be kept in position so that the teeth could be made to articulate.

An X-ray examination made with the compress and Barton's bandage applied showed that distinct deformity still existed, and it seemed that satisfactory correction of the deformity could only be obtained by wiring the fragments or employing an interdental splint, and Dr. Gritman, of the Dental Department of the University of Pennsylvania, made casts of both jaws, and from these casts metal moulds were made upon which the splint was shaped. The most difficulty in fitting the splint was due to the fact that the only retaining point posterior to the fracture on the left side of the jaw was a partially erupted wisdom tooth.

The interdental splint was applied on the fifth day after the injury, and the jaws were firmly held in contact with the splint by means of a Barton's bandage. An X-ray examination at the end of a week showed that the displacement of the fragment had been corrected and the articulation of the teeth was perfect. The splint was removed at the end of five weeks, and the articulation of the teeth was found perfect, but as the union at the seat of the fracture was not quite firm, it was re-applied for two weeks longer, making seven weeks in all that it was worn. Even at this time it did not seem safe to remove all retentive apparatus, so the patient wore through the day a light Barton's bandage, and was not allowed to use the jaw in mastication, and at night he re-applied the splint, to guard against any violent involuntary movement of the jaw during sleep. The patient during the whole course of treatment was kept on liquid nourishment.

The result obtained was an excellent one, there being absolutely no deformity and the articulation of the teeth being perfect.

DR. GEORGE M. DORRANCE (by invitation) said he had had during the past year 77 cases of fracture of the jaw, 23 of which he had treated with intermaxillary splints or interdental splints. Some were treated by the so-called Angle method, which really does not belong to Dr. Angle, others with the Matas splint, which he modified somewhat, and others with the Barton bandage. Reviewing all these cases he thinks the Barton bandage should



be discarded absolutely. In cases where it is impossible to obtain the interdental or intermaxillary splints the Angle or Dorrance modification of Matas' method give most satisfactory results. In speaking of results one takes the articulation of the teeth, not their alignment. If a fracture is within the line of the teeth all that is needed is an interdental splint which covers over the lower teeth. The patient can open his mouth, talk, and eat semi-liquid food. In every one of the 23 cases in which Dr. Dorrance used the intermaxillary or interdental splint he has perfect articulation. In those in which the Angle method was used he had some failures because the application was not correct, or because of the slipping of the two bands which go around the teeth. The Angle method consists of a band around the upper teeth and a band around the lower teeth, between these two there is a rod which is held in place by a clamp around the band on the upper teeth, and again by a clamp on the lower teeth. This holds the lower jaw against the upper. It is easily applied by a surgeon, but an interdental splint should be applied by a dentist. Dr. Dorrance has treated 3 cases of fracture of the upper jaw with the interdental splint. The jaw is immediately reduced and a cast taken, this will undoubtedly show some deformity, then another cast is made and a die is made of that, and finally a German silver die is wedged over the copper one. This silver splint is placed on the teeth by cement and fracture is in perfect position, and the patient can eat food he does not have to chew. The results from the intermaxillary and interdental splints have proven most satisfactory in every respect.

#### CASES OF FRACTURE OF THE PATELLA TREATED BY OPEN OPERATION AND SUTURE OF THE FRAGMENTS

DR. HENRY R. WHARTON reported the following cases:

CASE I—W. R., aged 23 years, in December, 1907, while fox-hunting, fell with his horse and received an injury of the left knee. A temporary dressing was applied and the patient was removed to the Presbyterian Hospital.

Upon the third day after the injury the patella was exposed by a transverse incision over the knee-joint, and a very large amount of blood-clot was removed. Examination of the fracture showed that there were three fragments, the upper fragment

consisting of two pieces, the smaller one to the left side was held by a periosteal hinge. The upper and lower fragments were drilled and were brought into apposition by several strands of chromicized catgut passed through the drill holes and secured by tying. After securing the fragments two additional layers of chromicized catgut sutures were employed to approximate the periosteum and capsular structures, and a third layer of silkworm gut sutures were employed to approximate the connective tissue and skin. A small cigarette drain was introduced at the angle of each wound before the capsular structures were closed by sutures. The wound was covered by a gauze dressing, and a plaster-of-Paris dressing was applied to the limb from the toes to the groin, with provision for strapping when dressing of the wound became necessary. The small drains were removed on the third day, and the sutures were removed on the tenth day, and the wound was found healed.

The plaster-of-Paris bandage was removed at the end of a month, and gentle passive motion of the joint and massage of the limb were practised. The patient was allowed to walk on crutches at the end of six weeks. Motion of the joint gradually improved, and at the end of ten weeks he walked with a cane. The function of the joint gradually returned, and six months after the injury he apparently had full extension and flexion of the joint. An X-ray taken eleven months after the injury shows the condition of the patella.

CASE II—Mrs M. R., aged 60 years, tripped upon a rug and fell, fracturing the right patella.

She was removed to the Presbyterian Hospital, and upon the third day after the injury the patella was exposed by incision, and the fragments and capsular structures were approximated, as in the case previously described. The dressing applied and the after-treatment were similar to that described above. The result obtained was very satisfactory, and at the end of six months motion of the knee-joint was almost perfect.

CASE III—Mrs R., aged 45 years, in August, 1906, fell downstairs, doubling her right knee under her, sustaining a fracture of the right patella. She was sent to the Presbyterian Hospital and was under the care of Dr. Hodge, who exposed the fragments by incision and approximated them by suture of

the capsular structures The patient did well and was discharged with good union of the fragments She states that she regained normal use of the limb

On February 12, 1907, she stepped upon a piece of ice and fell, fracturing the same patella She was admitted to the Presbyterian Hospital on February 18th, and the fragments were exposed by a longitudinal incision It was found that union of the fragments had occurred by isolated bony areas, five or six in number, the intervening union being fibrous The edges of the fragments were freshened, drilled and approximated by a few strands of chromicized catgut The periosteum and capsular structures were next approximated with chromicized catgut sutures, and the skin and connective tissues with silkworm gut sutures The limb was put up in plaster, and the case made a good recovery, and was discharged from the hospital on March 3, 1907

An examination of this patient within a few weeks, shows that she walks without a limp, and has regained full function of the knee-joint

#### OSTEOPLASTIC RESECTION OF THE SKULL

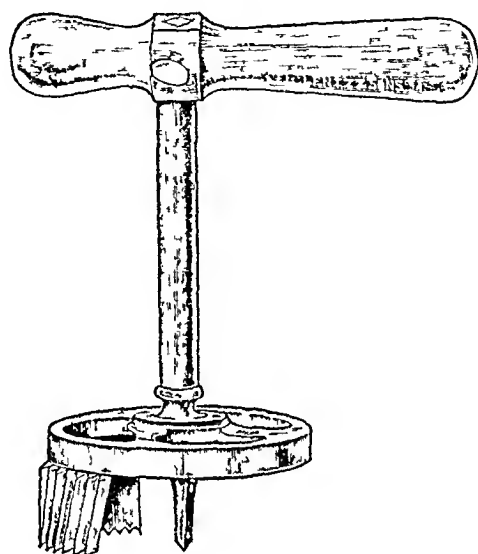
DR A C WOOD exhibited "An Instrument for Performing Osteoplastic Resection of the Skull," and read a paper upon the subject, for which see page 645

DR JOHN B ROBERTS said he was very much interested in trephining instruments and had employed Stellwagen's and others He showed last September at the State Medical Society a device of his own which he thinks is good, the instrument is simply the segment trephine, a modification of the old-fashioned trephine He has never made use of the Cryer instrument, run by a surgical engine, although he believes it to be one of the best instruments obtained if the power is run by a practised and competent man It is, however, very much more expensive than most individuals can afford The price of his modification of the old-fashioned trephine he believes to be only a few dollars Dr Roberts thinks Fetterolf's nasal septum rasp an exceedingly good tool to cut the hinge of the flap made by the segment trephine in osteoplastic resection of the skull

DR THOMAS C STELLWAGEN (by invitation) said that Dr Wood had overcome most of the difficulties that the surgeons had in the use of his instrument through his modifications When

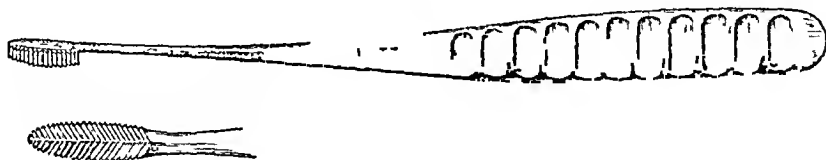
this instrument was first used the great trouble was that the pressure was put on the saw, they did not let the saw act with its own weight, and this pried the centrepiece away. Afterwards a plate was made to screw into the bone, which largely overcame the difficulty. This however required

FIG 1



extra time and so necessitated a little longer time in the operation. Dr. Stellwagen does not recall in some fourteen cases trephined in which he assisted, any case where there was an injury to the dura. He does not think the dura will be injured if ordinary care is taken in trephining. It may be scratched but he has

FIG 2



never seen a case where the dura was cut through. Another advantage of the plate is that it controls hemorrhage from the central portion of the flap and keeps it from being torn from its attachments. In one case which Dr. Stellwagen attempted to trephine for Dr. Deaver at the German Hospital the hemorrhage was so great that it was necessary to stop.

Dr Stellwagen said he thought there was one suggestion which might be made regarding Dr Wood's instrument to make it practical for the average surgeon. Instead of having an ordinary smooth tip to let into the bone, have it screw in, and then it will be held more firmly and will overcome entirely the danger of the point being pulled out. He thought Dr Wood's objection to the instrument in that it tired the wrist, was a proper one.

Dr Stellwagen referred to a case in which it took about twenty-eight minutes to get the osteoplastic flap up. He afterwards helped in the autopsy on this case and it took him about one hour to remove the calvarium.

Dr Stellwagen has seen a good many men try to use the surgical engine, and he thinks unless they are especially trained in its use it is a very dangerous instrument. He does not think the general surgeon has either the time or the inclination to become proficient with such a complicated instrument, it further runs so rapidly that it dulls the sense of touch.

Dr Stelwagen's own instrument was devised in 1903.

DR CHARLES F NASSAU referred to a demonstration given upon the cadaver before the Academy some years ago by Dr Hopkins, who used an instrument which in principle was exactly like the one presented by Dr Wood, except that it was very much larger, and Dr Hopkins employed a fixation apparatus of different character.

DR A C WOOD, in closing, said in regard to cutting the base of the bone flap, referred to by Dr Roberts, that he had a model of a saw to fit his instrument for that purpose. Dr Wood does not employ this method as a rule, but simply fractures the base.

In regard to the instruments run by power, such as the Cryer instrument, Dr Wood admits that they are very satisfactory when they work well but they have one great disadvantage which must always be borne in mind—they have great power for harm. He believes a great many operators can report a long series of cases without a serious accident, but such accidents do occur. In the circular-saw type, he has heard of the saw breaking loose from the handle and being thrown with great force. If the power instrument while in operation catches a fibre of gauze or other material it may be at once jerked from the hands of the operator who is powerless to control it.

# ANNALS OF SURGERY

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No 6

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## ORIGINAL MEMOIRS.

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### REMINISCENCES OF THE EARLY DAYS OF THE AMERICAN SURGICAL ASSOCIATION.<sup>1</sup>

BY J. EWING MEARS, M D,  
OF PHILADELPHIA

THE title of my paper presents an opportunity of speaking, in a reminiscient way, of the beginning days of the Association, of placing on record some of the notable events which have occurred in the first quarter of a century of its existence, and of indulging in some reflections on the influence it has exerted upon surgical science in this country, and on its development and growth in the future. It is impossible to speak of the foundation and early days of the Association without paying deserved tribute to the great Surgeon, its Founder, Samuel D Gross, who in such marked manner has impressed his character upon it.

In undertaking the task which is thus imposed, I am moved to express some hesitation, since, without formal consent, I have assumed to speak for those who, with me, constitute the survivors of the number, forty-four in all, who, in the year 1880, signed the Constitution, and became the original Fellows of the Association. P S Conner, W W Keen, and Solon Marks.

An intimate association with the Founder, and the enjoyment of official position in the Association for quite twenty-

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\* Read before the American Surgical Association, May 4, 1908

five years of its active work, may enable me to perform, in a manner acceptable to my co-survivors, the duty imposed

Of my acquaintance and association with the Founder I may, I trust, with becoming propriety, speak first

This acquaintance began when I brought to him, during the struggles of the Civil War, a letter of introduction from my father, a physician, who had been a college mate with him in Jefferson Medical College, and who had received his degree in medicine as a member of the first class which graduated from that institution, in the year 1827, after a full two years' course of instruction of three months each, reinforced by the fiction of a year's study and apprenticeship in the office of the preceptor, mayhap, in those early days the honored and beloved family physician in the city, or the autocratic Solon of the small community, the country practitioner, the deft wielder of the venesecting lancet, the unrelenting dispenser of drachm doses of the mild chloride of mercury and pint draughts of nauseous decoctions of barks and herbs, withal, the true friend, the wise counsellor, the bearer of cheer and sunshine into the cheerless room of the log cabin, the sagacious medical adviser, with knowledge founded upon years of carefully observed experience, the faithful physician, to whom the night was not given for rest, nor the day for recreation, whom storm did not stay, nor balmy breezes lure from duty

At the same time with me, making likewise his acquaintance, there came a Fellow of our Association, whose name, through the achievement of his distinguished ancestor, enriched by his own endeavors, will live forever in the history of surgery—John Collins Warren

The acquaintance with the Founder of our Association thus begun, ripened in the succeeding years into an enduring friendship, which ended only with his life, and controlled in marked manner my professional career. Honored by his confiding friendship, I learned to know him as a man, and as his assistant in his private and public surgical practice, I learned to know and appreciate him as the great surgeon, the eloquent and forceful expounder of the principles and practice of sur-

gery in the lecture hall, the erudite author of monographs and text-books on the science and the art of surgery, and the pioneer worker and author in pathological research in this country. He was not only the fearless surgeon, but, as well, the wise physician. With him, in many cases, the knife was the "dernier ressort," brought into action only after most careful study and discriminating judgment had made sure the need for its use, and his mind's eye had looked upon the hidden morbid condition, and had given to him a true picture of its nature. Diagnosis by exploratory operation was little, if, indeed, ever, cultivated by him, and Hogarth's artistic curves did not limit his operative procedures.

Of stalwart form, with a commanding presence and the front of Jove, he stood in the clinical arena the type of the great teacher. When inspired by the exposition of some important subject which was of paramount interest to him, and with which his mind and heart were filled, he rose to a majestic height, and the words of instruction which flowed from his lips, as the stream from the overflowing fountain, held his audience in close and charmed attention. His superiors, on such occasions, he had not—his equals, if such existed, were, indeed, few. "*Hier stehe ich, ich kann nicht anders*" Words which, with him, as with the great Reformer who gave them birth, gave expression to the resolute convictions which inspired his opinions and guided his teachings. A tireless worker, his day from early morn was given to ceaseless work, and in his office library he burned to the dregs the midnight oil. "Nulla dies sine linea," was the legend of his life, and it guided him to the last days of his years. With becoming deference the writer feels he can place on record words spoken on the day before death came to him. "I have yet work to do. Why should I die?" Overwhelmingly absorbed as he was in work, he yet gave time to much needed relaxation in social amenities. The doors of his hospitable home were ever open to members of his profession from all parts of the country, and to distinguished men of learning from all parts of the world. He appreciated, to the fullest extent, the value of this social inter-



mingling of members of the profession, as a means of promoting interchange of thought and the study of individual character, and he desired to make it a prominent feature of the Association he founded

Such is, in brief, a portraiture of our Founder. Filling the eminent position he did in our country, known as he was in the countries of the Old World, and crowned, as he had been, with the highest honors of their great institutions of learning, he, of all others, was best qualified to bring into existence an Association which would gather together, for the cultivation of surgery, the surgeons of the country, prominent as authors, teachers, and skilled practitioners. He designed it to be a school for mutual instruction and improvement, a court of supreme authority into which the great questions of Surgery should be brought for discussion and judgment, a gathering in social intercourse of the individual workers in surgical science. Medical politics was to be forever debarred, was to have no place in the deliberations of the organization. The great representative association of the medical profession of the country afforded a large field into which all questions affecting the "body politic," could be brought for adjudication—and were there to be left. Personal friendship was not to be the test of the qualifications of the candidate seeking admission into the Association, nor personal animosities or local factional contests the bars which would shut out the eligible candidate.

Our Founder, cherishing the desire he did with regard to the formation of the Association, called about him, at the time of the meeting of the American Medical Association, at Atlanta, Georgia, in the year 1879, a few of the prominent surgeons there assembled in attendance, and disclosed to them the object which was very close to his heart. Although this meeting has taken the place in the minutes of the Association as the first, in chronological order, it was simply a meeting for conference. Its purpose was to obtain an expression of the feeling which might exist as to the desirability of forming an organization such as he contemplated, and in order that formal discussion of the subject should take place, it was duly organ-

ized by the election of a chairman and secretary. The discussion which ensued developed the fact that the sentiment was markedly unfavorable, if not positively hostile. By some, the opinion was expressed that the movement had the character of an attack upon the American Medical Association, intended to destroy its influence as a representative body of the medical profession; it would originate, they contended, a condition which, if extended to other specialties of medicine, would result in its disintegration. It was claimed that all of the objects sought to be accomplished by such an Association could be accomplished through the Surgical Section of the American Medical Association.

Without taking any action whatever, the conference adjourned, and later, at a consultation held with friends of the project, it was decided to issue the following circular letter: "The undersigned respectfully solicit your cooperation in founding a National Surgical Society, to consist, exclusively, of distinguished surgical practitioners, writers, and teachers, and request you to attend a meeting to be held at the College of Physicians and Surgeons, New York City, on Monday, May 31, 1880, on the adjournment of the meeting of the American Medical Association. Signed by, W. W. Dawson, Moses Gunn, L. A. Dugas, W. T. Briggs, and S. D. Gross."

At the place, and on the date, given in the circular letter, surgeons who had been invited assembled, and a temporary organization was effected by the election of Dr. L. A. Sayre as Chairman. In some well-chosen remarks Dr. Gross presented the object of the meeting, and then moved that an Association, such as contemplated in the circular letter, be formed. This motion was unanimously approved, and he then offered a draft of a Constitution and By-laws, to constitute the organic law of the Association, which, on motion, was adopted, and those present forty-four in number, signed it, paid the initiation fee, and thus became the original members of the American Surgical Society, as it was designated in the draft of the Constitution and By-Laws proposed and submitted for adoption by the Founder. The formal and perfected organization

of the Association was then effected by the election of Dr Samuel D Gross as the first President and Dr J R Weist as the first Secretary, with other officers to conduct the business affairs of the Association. It was deemed desirable to submit the Constitution and By-Laws to examination and to revision, if found necessary, and to this end a committee, consisting of Drs John H Packard, John Ashhurst, Jr, John H Brinton, W W Keen, and J Ewing Mears, was appointed, and instructed to report at the next meeting, which, on motion for adjournment, was ordered to be held in Richmond, Virginia, on May 5, 1881.

With these ceremonies, simple in character, the American Surgical Association was brought into existence, charged with most important responsibilities as to the development and growth of surgical science in our country. By its organic law it imposed upon its members and their successors most responsible duties for the maintenance of the high standard of qualification of those who should be admitted to its Fellowship, as therein provided.

A national character was given to the Association in the list of surgeons whose names were affixed to the Constitution at this time of its organization. Among them was James R Wood and L A Sayre, New York, J C Hutchison, Brooklyn, E M Moore, Rochester, Moses Gunn, Chicago, John T Hodgen, St Louis, T G Richardson, New Orleans, Claudius H Mastin, Mobile, L A Dugas and Henry F Campbell, Augusta, Ga, R A Kinloch, Charleston, Hunter McGuire and James L Cabell, Richmond, Christopher Johnston, Baltimore, W W Dawson and P S Conner, Cincinnati, David Yandell, Louisville, Samuel D Gross, S W Gross, John Ashhurst, Jr, W W Keen, and T G Morton, Philadelphia, Solon Marks, Milwaukee, R Beverly Cole, San Francisco, and J R Weist, Richmond, Indiana, all distinguished as surgical practitioners, writers, or teachers. Of these surgeons of our country at that period, of the work accomplished by them, and of the influence exerted by the Association since its organization, Dr P S Conner, one time President, and one of the survivors of the

original Fellows, thus writes "I join you most heartily in appreciation of our early associates and recognition of the value of the work done and influence exerted by them American surgery to-day owes much to the American Surgical Association, and our literature has been much enriched by the contributions of those who are now but a memory."

As ordered, the next meeting was held in the city of Richmond, on May 5, 1881, at which nineteen Fellows were present and no scientific business was transacted The Committee on Revision of the Constitution and By-Laws reported several amendments, which were adopted, the most important of these consisting in the change of the name from the American Surgical "Society" to that of the American Surgical "Association," and those constituting the membership being designated as "Fellows" instead of "Members" The initiation fee was reduced from twenty-five dollars to ten dollars, and it was ordered by vote that the difference, fifteen dollars, should be returned to those who had paid the larger sum A subsequent alteration in the By-Laws fixed the sum at fifty dollars, where it now stands

Two surgeons who had been invited by the circular letter to participate in the organization of the Association, but who could not be present at the meeting held for that purpose in New York, were permitted to sign the Constitution as original members, this act making the total number forty-six Some feeling of discouragement was manifested at the absence of any scientific business, but this was soon dissipated by the encouraging words of the President, who called attention to the fact that all scientific bodies required time to perfect an organization, and he expressed the hope that a number of papers would be presented at the next meeting It is most interesting, as well as gratifying in the highest degree, to compare the programme of the present meeting, held in the same place and within a day, on the same date in the year, with that held twenty-seven years ago A grand total of forty papers, on the most important subjects, engaging at the present time the attention and study of the surgeon, five of which are to be

read by title, find place upon the programme Moreover, the presence and active participation in the scientific proceedings of the Association of a number of distinguished surgeons from abroad give a distinction to the meeting, alike honorable and gratifying Truly, indeed, has the prophetic vision of our Founder been verified, and fortunate are those of us who are present to witness its full accomplishment

The meeting at Richmond adjourned to meet at Coney Island, Long Island, New York, on September 13, 1882, at which time the meeting was held, and eleven Fellows were present Several papers were read and discussed It became evident at this meeting that there should be provided, in order to give the character to the Association it was intended to have, a definite system with regard to the scientific business, and that a reporter should be chosen, who should be an officer of the Association, whose duty it should be to take full and accurate reports of the scientific proceedings, to be published annually in a volume of *Transactions* In order to accomplish these important objects, amendments to the Constitution and By-Laws were submitted by the writer, which provided that the President should, in addition to the other duties of his office, appoint at each meeting six Fellows, to prepare papers for the next meeting, on subjects chosen, after consultation with the appointees, and from four to six Fellows who should discuss the propositions submitted in these papers, which were to be sent to them by the writers in ample time for consideration The reporter was to be designated as the Recorder, and was to be a member of the Publication Committee and the editor of the volume of *Transactions* In the twenty-five years of the life of the Association this important matter has undergone several changes and re-arrangements, the object sought for being always to provide the best method for the conduct of the scientific business of the Association,—one which would invite carefully prepared papers on important subjects, not in too great number, which should receive careful discussion, in order that, through this discussion, the judgment of the Association should be rendered and published to the world Later

revisions of the Constitution relieved the President of the duty of selecting readers of papers, and placed the duty in the hands of a Business Committee. Still later revisions of the Constitution confided the subject to the Committee on Annual Meeting, which consists of two Fellows elected by the Association, with the President, Secretary, Recorder, and Chairman of the local committee of arrangements, members *ex-officio*. This matter is regarded of so much importance as to justify its record in detail.

While there were several papers, five in number, read at this meeting, and some discussion of them, there appeared to be but little enthusiasm manifested, and discouragement as to the future success of the Association was in evidence. The committee appointed to select a place for the next annual meeting was requested by Dr S W Gross and the writer to name the city of Philadelphia, they feeling that in this city it would be possible to arouse interest in the purposes of the Association, and place it upon a stable foundation. The city of Philadelphia was chosen as the place of the next meeting, and Drs S W Gross, R J Levis, and the writer were appointed the Committee of Arrangements. At the time appointed, May 31, 1882, the Association met. There were twenty-five Fellows present, and the six Fellows appointed by the President at the last meeting read papers upon interesting subjects, which were fully discussed, in addition, two volunteer papers were read.

On taking the chair, the President delivered a short address, in which he pointed out the necessity for the founding of the Association, and denied, in earnest terms, that its organization was intended in any way to be a blow struck at the American Medical Association. He claimed that body would be strengthened by this organization, and have new life infused into it. He said "We can hurt no association now in existence, or likely to come into existence. We can only hurt ourselves if we fail to do our duty. We hope to make the American Surgical Association an altar upon which we may annually lay our contributions to surgical science, and to show to the world that we are earnest and zealous laborers in the interest

of human progress and human suffering " He called attention to the fact that the previous meetings, with the exception of that held at Coney Island, were held to perfect the organization of the Association The programme presented for the meeting promised important scientific work He referred to the importance of the social features of the annual reunions In this direction, the Committee of Arrangements in charge of this meeting had made ample provision In the executive session, on the concluding day of the meeting, the Secretary was, on motion, instructed to cast an affirmative vote for fifty candidates for election as Active Fellows, and six as Honorary Fellows, whose names had been selected, after informal consultation, on the part of the Council and Committee of Arrangement This action, which, at one stroke of the pen, as it were, extended the list of fellowship to ninety-six, within four of the constitutional limit, was an unusual procedure on the part of a scientific body It was largely the result of the enthusiasm engendered by the pronounced success of the meeting, scientifically and socially The feeling was unanimous that the Association had been successfully launched, and had taken its place as a recognized body in the surgical world Inspired, possibly, by the same feeling, an amendment to the Constitution was offered increasing the limit of Fellowship to one hundred and fifty This amendment was very wisely laid on the table, subsequently, on motion, it was taken from the table and ordered to lie over until the next meeting for action The effort which manifested itself on this occasion to increase the fellowship of the Association was finally successful, a few years since, in increasing the number to one hundred and twenty-five, a happy compromise The provision made by amendment to the Constitution for a class of Senior Fellows, in addition to the two already provided for, Active and Honorary, has given a very elastic limit to the Active Fellowship, and one which, while it will not limit the number of those eligible for active work, will keep it near to the original limit of one hundred Fellows The intention of the Founder of the Association, with respect to the character of the organization

he desired to found, was expressed wisely in the limitation of membership incorporated in the original draft of the Constitution. He sought to secure in the fellowship of the Association qualifications in the individual, not length in the roll-call. The limitation in fellowship fixed for the Association, gave it at once a standard of excellence and of honorable distinction, which stimulated worthy ambition and made admission into it an honor to be sought after.

An election for officers was held, and Dr. Gross was chosen for the fifth time to fill the high office of President. The city of Cincinnati was named as the next place of meeting, which was to be held on May 31, 1883. At this meeting sixteen papers, six regular and ten volunteer, were read and discussed. The amendment to the Constitution, in order for action at this meeting, fixing the limit of Active Fellowship at one hundred and fifty, was defeated. A resolution was adopted providing for a dinner at the future meetings of the Association, to be arranged by the Committee of Arrangements and to be paid for by Fellows participating therein. This dinner was given at a number of meetings, but was finally abandoned. The desire entertained by the Founder of the Association to include in the programme of the meetings a function of this character would seem to be worthy of consideration. A formal dinner is the climax of entertainment, and is, the world over, the accompaniment of the assemblages of the eminent men composing learned bodies in art, in science, in statecraft, in commerce, and in every and all associations of men engaged in carrying on the work of the world. The function might assume, in our Association, the form of a reception, to be held by the presiding officer, which would afford an opportunity for social intercourse among the Fellows, and would not only be enjoyable, but of service in promoting good fellowship and harmony in its work.

When the time for the election of officers arrived, Dr. Gross, in a few feeling remarks, declined to be again a candidate for the office of President. He thought it very desirable, and for the best interests of the Association, that there should



exist a system of rotation in the office. Such a plan would result in giving to the Association the benefit of new methods of administration, the infusion of fresh spirit into its work, the avoidance of control by routine and tradition. It was a source of great pride and gratification to him to see the Association in such a prosperous condition. He felt that the ambition he had cherished with regard to its foundation and successful beginning had been fully realized, and he wished to place into other hands the honors of office and the responsibilities of its further development and growth. That in coming years it would continue to maintain the high standard which had been fixed for it, and that it would exert always a most beneficial influence on surgical science in this country, he did not doubt. In a voice choked with emotion, he bade the Association an affectionate farewell.

In response to the words of parting spoken by the President, Dr. David Yandell, in most eloquent terms, expressed the feelings of regret entertained by the Fellows of the Association on learning of his decision to lay down the honors of office. His master mind, he said, had brought the Association into existence, and his master hand had guided its progress to this period of its life. With sentiments of high esteem and affection, to which words fail to give adequate expression, he bade him, on behalf of his associates, farewell.

Dr. E. M. Moore was elected President, a few candidates for Fellowship were elected, and the Association adjourned to assemble in Washington, on April 3, 1884. It would seem appropriate to limit the chronicles of the early meetings of the Association to those over which our Founder, as the first President, presided. Some interesting events, however, transpired at the meeting which succeeded his retirement, which was held in the city of Washington on April 3, 1884, which are worthy of record. There were forty-three Fellows present, and thirty papers were presented, eighteen of which were read and discussed, and six were read by title. The number of Fellows present, and the number of papers presented, were the largest of any of the meetings yet held. At this meeting the

resignations of three Fellows, two Active and one Honorary, were presented and accepted, this action being in response to the request of the Association, by reason of alleged violations of the Code of Ethics of the American Medical Association, which had been adopted and incorporated in the Constitution of the Surgical Association. Since then this clause of the Constitution has been, very wisely, expunged. An event which caused a feeling of much sadness was the illness of Dr. Gross, which unhappily proved to be his last. Desiring to give evidence of his continued interest in the scientific work of the Association, he had sent a paper, prepared in the beginning days of his illness, on "Wounds of the Intestines," which was read by Dr. T. G. Richardson, of New Orleans, one-time his student. Telegrams expressive of the great regret felt by the Fellows of the Association, and of the hope of his speedy recovery, were sent to him by the President. On account of the illness of Dr. Gross, the annual banquet was omitted.

A most noteworthy event of this meeting was the presentation by the Recorder, Dr. J. Ewing Mears, of the report of the Committee of Publication, giving an account of the publication and issue of the first volume of the *Transactions of the Association*, the edition numbering five hundred copies. This volume contained five hundred and sixty-eight pages, and included all of the papers read at the meetings held at Coney Island, Philadelphia, and Cincinnati, thirty-two in number, with the discussions, and seventeen illustrations. The cost of the volume was \$1393.63. It had been distributed to the Fellows of the Association, Active and Honorary, to medical libraries in this country and abroad, complimentary copies were sent to distinguished members of the profession at home and abroad, and one hundred copies were deposited for sale. Before the binding of the volume was completed, the Recorder sent to Dr. Gross a copy of the unbound leaves, and received from him a note commending it as a volume worthy of the Association, and concluding his note with this injunction: "Don't cut the leaves," which was obeyed, and the first volume was issued with uncut leaves.

On retiring from the office of President, Dr Moore called attention to the work the Association had accomplished during the session just completed, and pronounced it good. He felt called upon, however, to state that the provisions of the Constitution had been violated, inasmuch as thirty papers had been presented, twenty-four of which had been read in full and discussed, and six read by title, instead of only six, or two each day, as therein provided for. He earnestly recommended that in the future this clause of the Constitution be strictly complied with, since it would lead to the presentation of more carefully prepared papers and afford more time for their reading and discussion. "This," he said, "is a most important matter, and should claim the earnest attention of the Association. We desire quality not quantity."

A feeling having been expressed that the interests of the Association would be promoted in having a permanent place of meeting, it was ordered by vote that in the future the meetings should be held each year in the city of Washington, at the time fixed on the adjournment of this session. This was done for a period covering eight years, until the year 1892, when it was decided to return to the peripatetic or itinerant method, assembling every third year in Washington, at the time of the meeting of the Congress of Physicians and Surgeons. While much that is interesting and instructive is to be seen and enjoyed at the various places of meeting of the Association, crowned on the present occasion by social events of most gracious courtesy, it is an open question whether a fixed place of meeting would not contribute to a more serious execution of its business, its real business, its scientific work. One of the constituent societies of the Congress, that of the American Physicians, has adopted this plan, and, I believe, it is the custom observed generally by scientific bodies abroad.

The selection of a permanent meeting place for the Association might result in the future years of its existence in the erection in the city of Washington of a building suitable for its purposes, provided with an assembly hall, a banquet-room, and other rooms for the meeting of the Council and committees

intrusted with its business affairs As years increase, the surplus volumes of our *Transactions* and the archives of the Association will accumulate, and should have quarters in which they may receive careful preservation A movement begun at this time, the termination of the first quarter of a century of the existence of the Association, may secure sufficient funds to make a beginning Contributions and endowments in years to come may assure the realization of the project The advantages which will come to the Association in carrying out a plan of this character may not be fully foreseen, but that they will come would seem to be undoubted It will give solidity and dignity to our Association to be an incorporated body quartered in a permanent abode in the capital city of our great and growing country Should not American surgery have an imposing temple upon whose walls shall be emblazoned the names of those who in the past have been its pioneers, and who have, by their achievements, made its history, honorable above reproach, and enduring in its character?

With this account of the early meetings of our Association, and of the more important events which transpired in the early days of its life, we may rest in our detailed report In the meetings which have followed, in each year, important work has been done Upon the subjects of surgery which have claimed the attention of the surgical world papers have been written, discussions held, conclusions determined, and published to the world

It will be interesting to place on record the titles of some of the papers read and discussed at the early meetings of the Association

Among them, by Dr S W Gross, "The Influence of Operations upon the Prolongation of Life and Permanent Recovery in Carcinoma of the Breast"

By Dr E M Moore, "Report of Cases Illustrating the Conditions of Luxation of the Ulna in Connection with Colles' Fractures"

By Dr John H Packard, "Esophagotomy without a Guide"

By Dr Moses Gunn, "Treatment of Fractures of the Skull, Recent and Chronic, with Depression "

By Dr R J Levis, "Treatment of Transverse Fracture of the Patella, with the Object of Producing Bony Union "

By Dr J R. Weist, "Foreign Bodies in the Air-passages—A Study of 1000 Cases to Determine the Propriety of Bronchotomy in such Accidents "

By Dr. W T Briggs, "The Antiseptic Treatment of Wounds after Operations and Injuries " Read at the meeting in 1882

By Dr J C Hutchison, "A Résumé of the Etiology, Pathology, Diagnosis, and Treatment of Morbus Coxarius "

By Dr Nicholas Senn, "Intracapsular Fracture of the Neck of the Femur with Bony Union "

By Dr J Ewing Mears, "The Intraperitoneal Method of Treating the Pedicle in Ovariectomy "

By Dr C B G Nancrede, "Have we Any Therapeutic Means as Proven by Experiment, which Directly Affect the Local Processes of Inflammation? "

By Dr B A Watson, "Lister's System of Antiseptic Wound Treatment versus its Modifications "

By Dr T G Richardson, "The Use of the Trephine in Traumatic Empyema Associated with Thoracic Fistula "

By Dr Samuel D Gross, "The Value of Early Operations in Morbid Growths "

By Dr Basil Norris, Surgeon, U S A , "Dislocations of the Astragalus "

By Dr P S Conner, "Excisions of the Tarsus, with a Report of Two Successful Removals of the Entire Tarsus "

By Dr Solon Marks, "Trephining the Sternum for the Removal of a Foreign Body from the Anterior Mediastinum, with a Report of a Case "

By Dr S W Gross, "A Case of Nephrectomy for Medullary Carcinoma, and Partial Cholecystectomy for Calculus in Same Subject "

By Dr J Ewing Mears, "Closure of the Jaws and its Treatment by a New Method of Operation "

By Dr Henry F Campbell, " Strictures of the Esophagus, Their Nature and Treatment, with Cases "

By Dr Samuel D Gross, " Wounds of the Intestines "

By Dr L McLane Tiffany, " A Contribution to the History of Ligation of the Common Femoral Artery "

By Dr B A Watson, " An Experimental Study of Anesthetics "

By Dr C B G Nancrede, " Surgical Interference in Cerebral Abscesses "

By Dr S W Gross, " Gastrostomy, Esophagectomy, Internal Esophagotomy, Combined Esophagostomy, Esophagectomy, and Retrograde Divulsion in the Treatment of Strictures of the Esophagus "

By Dr Nicholas Senn, " Experimental Researches on Cicatrization in Blood-vessels after Ligation "

By Dr J Ewing Mears, " A Contribution to our Knowledge of the Pathology of Trifacial Neuralgia, with the Report of a Case in which Three Inches of the Inferior Dental Nerve was Excised," with the suggestion, for the first time made, as stated by Krause, of the removal of the Gasserian ganglion for permanent relief in such cases

By Dr John B Roberts, " The Localization of Perinephric Inflammation, by Means of Clinico-Anatomical Study "

By Dr J Collins Warren, " The Healing of Arteries after Ligation "

By Dr Nicholas Senn, " An Experimental and Clinical Study of Air Embolism "

By Dr Christopher Johnston, " Diagnostical Laparotomy "

By Dr Harold C Ernst, by invitation, " A Consideration of the Bacteria of Surgical Diseases "

By Dr Roswell Park, " A Case of Lipoma of the Testes, Weighing Four Pounds, a Successful Nephrectomy for Fibrocystic Disease of the Kidney in a Boy, aged Twenty-three Months "

The limit in time, for the reading of papers and for discussions, has been from time to time a subject for decision

At the meeting in 1885 it was moved to limit the time for the reading of a paper to thirty minutes. A motion to amend was made to limit the time to forty-five minutes, and, finally, it was moved to limit the time to one hour, which was adopted. At present the time limit is fifteen minutes, a significant change, and one open to discussion as to whether it is quite just to the writer of a paper, who has given time and work to its preparation, to be compelled, by the time limit, to stop the reading at, possibly, the most important part, and thus fail to bring the subject before the Association in proper form for intelligent and full discussion. Better, fewer papers with ample time for their reading and discussion, than a mass not fully read nor discussed in a proper way.

A most notable event, reference to which should not be omitted, occurred in the movement which had its origin in the Association, and which resulted in the foundation of the Congress of American Physicians and Surgeons. To the zealous efforts of Dr. Claudius H. Mastin, Fellow of the Association and one time its President, the Congress owes its existence. At the meeting of the Association held in Washington, April 28, 1886, Dr. Mastin presented a communication in which it was suggested that action be taken by the Association to secure the formation of a Congress of American Physicians and Surgeons by the union of the nine special societies then existing. After the reading of the communication and some discussion of the project, a motion to lay it on the table was made, and defeated. On motion then made by the writer, the Memorial was referred to a special committee consisting of Drs. Christopher Johnston, W. T. Briggs, and the writer, with instructions to report during the session. The Committee reported as follows: "That it views with great satisfaction the perfection of a plan through which the meeting of the special associations named in the Memorial, in the city of Washington at the same time of the year, may be accomplished, and the meeting of all of these associations in general assembly on such days as may be determined for the purpose of addresses upon the general subjects in medicine. Such meetings to be held without any

formal organization, through which the associations meeting will sacrifice their autonomy" The Committee presented a resolution asking for the appointment of a committee of five Fellows, authorized to confer with committees of other associations interested in the adoption of a plan of a convention, and report at the next meeting The resolution was adopted, and Drs Claudius H Mastin, Charles T Parks, J Ford Thompson, Nicholas Senn, and the writer were appointed members of the committee

In due time the Congress was organized, and it holds now its meetings every third year in the city of Washington Of the great influence exerted by it upon the progress of medicine in our country there can be no question, in one organization it unites the workers in all of the special branches of medicine

Dr Reginald H Fitz, President of the Congress at the last meeting, writes "I believe in the Congress as a means of promoting acquaintance between representative men in the various parts of the country Progress in medicine depends upon the individual worker, and encouragement comes from the Association"

Another event of special interest to the Fellows of the Association should be noted—the erection of a bronze statue of the Founder of our Association in the city of Washington The funds necessary to accomplish this object were contributed, in part, by the Government, which not only gave the site, but appropriated \$1500 for the pedestal, by the Fellows of the Association, by the Alumni Association of Jefferson Medical College, by members of the medical profession throughout the country, and by friends outside of the profession The site of the monument, near to the Smithsonian Institution and to the Library of the Surgeon-General of the United States Army, is well chosen, and affords an opportunity to those who visit these depositories of scientific lore to look upon the features of one who filled an eminent position in his Profession and achieved, through his labors, enduring honors

Our Association returns to this city, the capital of the



historic commonwealth, which was the birthplace and the home of George Washington, who will ever live in the hearts of the people as the Father of his Country, to celebrate its silver anniversary. In commemoration of this happy event, its loyal sons, bearing tokens of devotion, come to pay homage at its Court, to testify in terms of congratulation to the great work it has accomplished, to honor the name it has given to American surgery, to speak for the future the words of hope, and to renew their pledges of loyalty to the promotion of its high aims.

We, the few survivors of those who began the work of the Association, bring wreaths of victory to lay upon its altar, the emblems of faith which has been well kept, of work which has been well done. For them, and in their name, we ask that the high ideals cherished by our illustrious Founder may ever control the endeavors of our Association, and be the guiding star of its destiny.

# PSYCHICAL END-RESULTS FOLLOWING MAJOR SURGICAL OPERATIONS.\*

BY JAMES G MUMFORD, M D,  
OF BOSTON, MASS

ASSISTED BY JOHN B HARTWELL, M D.

SAID John Hunter to a patient with an obstinate running sore, who was brought to him in consultation "And so, sir, you have an obstinate running sore"

"Yes, Mr Hunter"

"Then, sir, if I had your obstinate running sore I should say, 'Mr Sore, you may run and be damned' "

A patient of my own, two years convalescent from a fractured patella, lived in a condition of fancied pain, in despondency and worry lest he should never be able to resume his vocation as a mounted policeman The seriously flippant suggestion that he lock his worry in a bureau drawer, and mount his horse daily, restored him to the force in less than a fortnight

Last year Dr VanderVeer reminded us of worry as an interesting and possible etiological factor in the development of breast cancer

Such anecdotes and conceptions are familiar to us all, and the experienced surgeon of reflective temperament doubtless considers the psychic elements in his cases, but I doubt if we are aware always how deeply significant those elements may be in controlling the return to health of a surgical patient Rather are we wont to accept the patient from the hands of his physician, to shrug perhaps at what we are pleased to call his neurotic state, to proceed with the operation if the obvious lesion warrants it, then, with an anatomical cure established, to shift the case back upon the weary physician for the tedious struggle back to health

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\* Read before the American Surgical Association, May 5, 1908

I do not maintain that we should refuse to operate upon such discouraging cases. On the contrary, I believe, as Dr White long ago taught, that such operations—the operation *per se*—do great good, and are important therapeutic agents. My thesis is that we should appreciate clearly the types of individuals liable to suffer from post-operative psychic disturbances, and the surprisingly large number of such persons, that we should perform the operations, of intelligent purpose, and most of all that we should recognize our ability to aid in the after-treatment, and should bear our share of its responsibility.

With such thoughts in mind I have made a careful, systematic study of a large group of general hospital patients, who were operated upon between seven and nine years ago. The task has been laborious and at times discouraging. Allow me a word about the character, scope and method of the investigation.

I undertook to select 500 consecutive mutilating operations of expediency, excluding all emergency cases, such as those of acute appendicitis and extra-uterine gestation, all traumatic cases and cases of malignant disease, cases of plastic surgery, such as hernias and perineorrhaphies, and such cases of chronic appendicitis as were not giving rise to mild symptoms at least, at the time of the operation, 500 cases of major operations, but how shall we define a major operation? The Century Dictionary tells us it is an operation involving some danger to life. What operation does not involve some danger to life? The term is as hard to define as is the term gentleman. We all think we know the breed, and we let it go at that. I sent for the patients and corresponded with them. As one would expect, a majority did not respond, but I was enabled to study satisfactorily 129. Nearly all of these 129 were unusually intelligent persons, belonging to our best class of hospital patients, and they furnish figures sufficient on which to base just conclusions. I believe I undertook my task with an open mind,—certainly with no intention to prove a hypothesis.

Certain of my figures are interesting, though the rehearsal of figures is always somewhat dreary. There are 91 women in the list of correspondents, and 38 men only, for men in hospitals are more commonly the victims of trauma than are women. Further, under the limitations of my search I found that a large majority of both men and women in my completed list had been operated on for lesions of the generative organs,—68 of the 91 women, 23 of the 38 men. The remaining 38 patients had suffered from such miscellaneous disorders as gall-stones, chronic appendicitis, benign tumor, goiter, loose cartilage in the knee joint, joint tuberculosis, renal tuberculosis and so on through a long list.

As for the persons afflicted with diseased sexual organs (and I include the female breast in this group of organs), of the 68 women the diagnoses were ovarian tumor, 22, uterine myoma, 19, salpingitis, 11, fibrous tumor of breast, 7, cystic tumor of breast, 6, menorrhagia necessitating hysterectomy, 1, hydrosalpinx, 1, procidentia, 1. Total, 68.

Of the 23 men with diseased sexual organs the diagnoses were varicocele, 8, hydrocele, 7, tuberculous testis, 5, hypertrophy of prostate, 2, benign tumor of scrotum, 1. Total, 23.

With such figures before us, few as these figures are, we must consider the significance of certain clinical terms. What is the meaning of the words *cure*, *anatomical cure*, *psychical result*? I take it that a cure is the important end of all therapeutic endeavor, a perfect cure is the *summum bonum*, but is it not true that a large proportion of our cures are relative only? The man with a disabling recurrent appendicitis is absolutely cured of all pain and digestive distress through the removal of his appendix, the man with gangrene of the foot is relatively cured by amputation, though he be left maimed and halting. The woman with an ovarian cyst enjoys an anatomical cure when the tumor has been excised, and the wound has healed kindly and soundly, though an unessential organ has been removed. All these are clinical cures, are cures from the surgeon's point of view, but just here there enters into the problem an element of wide-reaching metaphysical

significance The ills of life, like all the so-called facts of life, are in direct relation, and are proportionate to our experiences The man who has just lost his appendix, if he lacks poise and clear vision, feels that he has been through a grievous crisis, that he has suffered a great cruelty in the operation, that the sanctity of his vitals has been violated, and that he can never again be what he was Many persons hold that view, I find

The man who has lost his foot may find little comfort in his freedom from pain and impending death His old life is gone He must readjust himself to new circumstances of existence His relations to his environment must be recast He must limp, a cripple, through the remainder of his life, bearing with him an unsightly stump and a grievous scar to fret and distress him

The woman whose ovary was removed, useless though that ovary may have been, believes herself to have been unsexed; she has heard tales of changes in temperament, of coarsening features, of mannish tendencies Or, perhaps, she thinks a full set of ovaries essential to sound health and the bearing of womanly cares She looks forward to some mysterious ill-defined change in herself, or to invalidism, and the reassuring farewell words of the surgeon fail to turn her from the expected melancholy course Strong character and optimism are needed to overcome these tendencies of environment and condition unless aid be brought from outside sources

How then shall we define a *cure*? I protest that a cure consists only in returning a man to that state of physical and mental health which shall enable him to live his life, to accomplish his wonted work, to adapt himself to his environment in vigor of body, and in freedom from pain, with his normal functions undisturbed, with his mind unclouded, buoyant, assertive That is the perfect cure, but it is a cure not easy of attainment A more common and reasonable condition of cure is a state of relative comfort and efficiency, with little pain and distress, with infrequent anxiety, with renewed if imperfect confidence in the bodily powers

By the term *anatomical cure* we imply a sound wound-healing and a restoration of the bodily functions so far as such restoration may be compatible with the loss or damage to members and organs

*Psychical results* are related to the subjective mind. Their bearing upon the cure concerns the patient not in proportion to anatomical perfection, or to potential physical and intellectual capacity, but rather to what he himself feels to be his perfection or capacity, and just in so far as his objective intelligence is feeble or has become enfeebled, just so far is he fated on the one hand to remain a wreck, or on the other hand to refit his shattered being. We must teach ourselves to look to the ultimate prognosis. It is not what we are, it is what we think ourselves to be. That is the sum total of the old argument.

Such conceptions lead us to a fair and just estimate of the results of surgery, and with such conceptions in mind we study with renewed interest the story of a large and important group of surgical patients, bearing in mind also a constant endeavor, in estimating psychical end-results, to distinguish actual anatomical failures from psychical failures due to the fact of operation in itself,—to the patient's mental distress that an operation was performed, to his skepticism, to his belief that it aggravated the disorder, to fear that another operation may impend.

There were then 39 men in our completed list, we shall consider first the men, and then the women. Of the 39 operations, 7, or 18 per cent, were unsuccessful in the end, shall we call them failures? All of these failures were *psychical* failures, and all of the operations were on the genital organs,—for varicocele, for hydrocele, for tumor of the scrotum. These seven patients were young men, apparently vigorous. They tell us that they "feel worse than ever." They complain of "pain, weakness, and feeling miserable and good for nothing," that there is "loss of will power," and that they are "weaker than before." There were 23 operations of this genital class,

so we find that 30 per cent of such operations on the genitalia may result in failures<sup>1</sup>

Such a finding may not surprise surgeons, but if a further analysis and consideration of the figures represent truly the average of general hospital results, we see that late psychical disturbances after operations on men are rare, and may be disregarded in our prognoses, *except* in the case of these operations on the genitalia, and that after operation on the genitalia of men we must expect persistent neurotic or psychic distress in a third of our cases

May not these considerations induce us to amend or to alter the common assertion that psychical disturbances occur in the despised class of neurotics only? These unfortunate final invalids of my list, before operation, were no more feeble mentally and physically than were their fellows. After operation, 30 per cent of the genital victims developed psychical ailments, while no other men on the list developed such ailments. Must we not conjecture, if we may not assert, that there is some factor inherent in these genital cases, which makes for subsequent nervous disturbances in all except the firmly balanced men? It will be objected, of course, that many men with slight anatomical lesions of the genitals seek operation for the sake of some fancied benefit, and that they are correspondingly disturbed mentally by the lack of any subsequent conspicuous anatomical improvement. Here is an interesting fact: no one of those men who were failures psychically suffered the loss of organs. Their distended veins were removed, their vaginal tunics were excised, but their testes and other essential organs were not disturbed. Shall we assume, as we seem justified in doing, that the very presence of those intact generative organs, associated with the fact of an operation, and the fear that, though sexual powers were not lost, still there remained the possibility of such loss,—shall we assume that this complex of circumstances and ideas have united to make wretched these lives? The merchant who sits

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\* I am aware that these figures are significant merely. They are too few to justify broad conclusions.

in his office expecting bankruptcy is an unhappy, unnerved wretch. The same merchant revives his drooping spirits and retracts his beams after the blow has fallen. And singularly enough our studies of the hospital list show us—as a comparison with the psychic wrecks—that an equal number of men who have actually lost important organs, testes and prostates, that these men have no psychical disturbances, whether or not they are anatomically cured. They have lost their testes and their prostates and they may suffer from tuberculous sinuses and incontinence of urine, but they are reasonably cheerful, vigorous and useful men.

The significant observation regarding the men in our list therefore is that those suffer especially from psychic disturbances who are left with sound functioning sexual organs, but are living in dread that the enjoyment of those organs some day may be lost to them. If this observation be true it brings us back directly to the second great fundamental fact of all life—the attitude of the sexes towards each other, and the obligation of procreation. These are elemental conceptions, outgrown by those rare individuals only, whose intellectual development may have taught them completely to subordinate the physical to the intellectual part of their being.

The women in our list furnish us with a problem somewhat similar to that of the men, but represented in larger and more complex figures. I have said that of the 91 women, 68 were operated upon for some lesion of the sexual organs, and that these operations were mutilating. If we accept our previous definition of cures, we find that 33 of these 91 operations were in some sort failures, but that 5 only were anatomical failures, while 30 were psychical failures. In other terms, 40 per cent of the operations were failures, but 35 per cent of this 40 per cent were psychical failures. And bear in mind that all of these cases of psychical failure are recorded "well" at the time of their discharge from the hospital. Let us examine the cases of sexual and of non-sexual mutilation among these women. 68 of the 91 women are in the sexual list, 23 in the non-sexual list. Of the 68 in the sexual list,



25 are failures, but 24 of these are psychical failures. Of the 23 in the non-sexual list, 8 are failures; and of these 8, six are psychical failures. We remember that in our list of men there were no non-sexual failures. Perhaps these confusing figures will be more obvious if we reduce them to percentages.

#### STATISTICS OF WOMEN

Total number of operations	91
Total number of failures	37.4 per cent.
Total psychical failures	35 per cent
Total operations on sexual organs	68
Total failures in operations on sexual organs	37 per cent.
Psychical failures in operations on sexual organs	35 per cent
Total operations on non-sexual organs	23
Total failures in non-sexual list	35 per cent.
Psychical failures in non-sexual list	26 per cent.

Thrown into general terms this table means that while three-fourths of the operations in women were on the sexual organs, both sexual and non-sexual operations showed a nearly equal percentage of failures, and that in both sets of operations the psychical failures far out-number the anatomical failures. And further, women appear to be poor psychical risks after all operations, but somewhat worse after sexual than after non-sexual operations.

Let us enquire further as to the various subordinate types of those operations which have been followed by psychical disturbances, early or late.

#### GYNÆCOLOGICAL OPERATIONS

	Total	Total failures	Psychical failures	Per cent psych failures
Ovarian cysts	22	8	8	36.4 per cent
Myomata uteri	19	8	8	42.1 per cent.
Salpingitis	11	6	5	45.5 per cent
Fibromata of breast	7	2	2	28.6 per cent
Cysts of breast	6	1	1	16.8 per cent.

Our cases, not included in the table above, are too few in each class to afford instructive figures, but the results of the totals are those I have given in Table I. As for the classes in Table II, no one class is particularly striking, but in gen-

eral terms it appears that mutilating operations on the uterus and adnexæ give a worse showing psychically than do operations for non-malignant breast tumors. One asks, perhaps, on what we do base our conclusions that these patients are psychic failures. On the following circumstances the patients are recorded as anatomically "well" on leaving the hospital, and they have been asked the following questions eight years later: (1) How long had you been suffering before your operation? and how? (2) Could you work? (3) When did you get back your strength after the operation? (4) How long after leaving the hospital before you could do your regular work? (5) Did the operation cure you completely? (6) Are you glad you had the operation? (7) Have you had any return of the old trouble? (8) Have you had any bad symptoms due to the operation? (9) Do you worry about yourself? (10) If so, why?

My conclusion that certain patients regard themselves as still unsound is founded on a careful record of their complaints. Their replies are all quite similar and are variations of such phrases as, "I am very weak, and have had no relief", "I am greatly debilitated", "I have been a wreck for five years", "I have the old pain and am very nervous and weak", "I have never been strong, am weak, nervous, tired and easily confused", "I have poor endurance, and am more weary than before," etc., through columns of similar writing.

So much for the surface value of these studies, and in this brief paper I have been able to touch on a few phases only of our elaborate figures. If I were to leave the matter here, however, I should be giving a grossly false and pessimistic impression of the advantage of surgical operations from the patient's point of view. Nearly all of my correspondents—the most pronounced psychic wrecks even—assert that they are glad the operation was done. The persons with anatomical failures are those who regret the operation. The persons with psychic failures are feebly complacent because, as they say constantly, their physician has told them that the choice lay between operation and death or a worse invalidism.

Another and important factor in this investigation is the personal equation of the investigator. I endeavored to meet this difficulty by maintaining an unbiassed attitude and by associating with myself a critical assistant who had no special previous interest in the matter. Nevertheless I admit that other surgeons might read other interpretations into the answers we received.

I believe there is a further and striking observation to be made in connection with these studies, and an important lesson to be drawn, which should influence our practice.

Private practice will show no such large percentage of psychical failures as hospital practice shows. I say this without the figures of private practice at hand, but eighteen years of experience in such practice, and the careful following of all private surgical cases convince me that what is now an impression merely would be proved a fact.

The reason for this assumed divergence in the results of general hospital and private practice does not depend upon the types of patients. If the type of patient determined psychical results, I believe the failures in private operating would be greater than in hospital operating. The reason for the divergence is that the personal influence of the surgeon is allowed to count constantly for good in the case of private patients. This is no time for a dissertation on psychotherapy, but all men who are in any way alive to the experience and teaching of recent years, must recognize the significance of the healer's personal influence, by whatever special name that healer may be called.

The patient goes, or is sent, to a surgeon because that surgeon is assumed to be a person specially qualified to treat that patient. The relationship thus established is, or should be, one of assured confidence on the part of the patient. As a rule, and while this relationship is maintained, the progress of the patient is good. Delay in progress and the development of psychical symptoms appear after the immediate relationship is severed. Almost instinctively we recognize, or should recognize, this fact in the case of our private patients,

and we keep them under more or less constant observation until health is restored. Later, if trouble develops, or bad symptoms recur, such patients return to the surgeon, often for encouragement and reassurance only, and the benefit secured appears constantly and notoriously out of all proportion to the advice such patients receive. For such special advice to the special patient, and for the special ailment, the surgeon must be more effective than the patient's family physician even though with that physician the surgeon must be in constant and cordial correspondence. By such means only shall the surgeon bear his share of the responsibility, and realize properly the ultimate prognosis.

But the hospital patient,—how shall he share in these benefits? I confess the problem seems almost impossible of solution, as our great city clinics are constituted. Some little is now being done, perhaps, through such social visiting movements as have been attended by an interesting success, of late, at the Massachusetts General Hospital. Neurotic patients are visited by trained persons at their homes and working places. Their home life, the circumstances of their work, their worries, difficulties, and mental states are investigated, and they are given intelligently a sense of being guided and supported towards better things. The busy surgeon cannot undertake such tasks, but he may avail himself of expert assistance in these lines, and may see occasionally the worst of the cases which are reported to him. In desultory fashion I have myself tried this plan, and am satisfied that it has brought back some discouraging cases to a cheerful and useful life. It is an old story that we specialists are in danger of drifting away from the proper function of a physician,—the restoring of health as well as the saving of life. I believe that in the nature of our work we cannot with propriety act as pure material scientists only—as mere investigators, experimenters and operators. With a little added thought, and with the proper machinery of assistants and subordinate workers, we should be able to eliminate largely the considerable number of psychic failures and invalids who trace their pains to the surgeon's incomplete endeavors.

# SURGICAL ASPECTS OF GRAVES' DISEASE WITH REFERENCE TO THE PSYCHIC FACTOR.\*

BY GEORGE CRILE, M.D.,

OF CLEVELAND, OHIO,

Professor of Clinical Surgery in the Western Reserve University

WE may accept as proven the fundamental proposition that if a sufficient amount of the thyroid gland in Graves' disease be successfully excised relief or cure will follow. Whether the relief or cure be complete or incomplete is dependent upon the correct or incorrect judgment in estimating the amount of gland tissue to be removed. In my earlier cases I frequently erred on the side of removing too little. The relief that follows the removal of a sufficient amount of gland tissue is comparable to the relief from withholding drugs which cause excitation. The extraordinary subjective relief is expressed largely in psychic terms. It resembles most the phenomena of good news in contrast with bad. Buoyancy supplants gloomy depression. The objective signs of improvement follow later. The psychic and metabolic phenomena are closely interwoven.

The serious barrier to surgical treatment is the immediate operative risk. This risk is not shock, it is not hemorrhage, it is not infection, it is hyperthyroidism. What produces the hyperthyroidism? Operation upon parts of the body other than the thyroid gland in acute Graves' disease is quite as fatal as operation upon the gland itself. Simple accidents occurring in Graves' cases often prove fatal. In acute Graves' disease death may be precipitated by psychic excitation, but psychic excitation cannot be separated from accidents. From the literature, from the general phenomena, from certain experiments, and from the following specific cases, were derived the methods to be hereafter proposed in operation upon these cases.

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\* Read before the American Surgical Association, May 6, 1908

In the case of a young physician with acute Graves' disease not responding to the best available medical care an operation was performed. On the day of the operation the hyperthyroidism steadily increased as the hour for operation approached, it was accelerated on his way to the operating room, and culminated in a wild toxic delirium while passing through the first stage of anæsthesia. The operation was short and was technically satisfactory. The toxicity, however, was progressive and he died in the tenth postoperative hour. Temperature at the time of death was  $110^{\circ}$ .

A young woman with acute Graves' disease became delirious during the preparation for operation under cocaine. The hyperthyroidism rapidly rose, and she died three hours afterward. The temperature at the time of death was  $107^{\circ}$  and rose  $\frac{3}{4}^{\circ}$  during the first hour after death.

Another case of acute 'Graves', during the preparation for operation and during the first stage of anæsthesia, became so toxic that no operation whatever was performed. The symptoms of thyroid poisoning were progressive and she died eight hours later. The temperature at the time of death was  $109^{\circ}$ , and it rose  $1^{\circ}$  after death.

These cases appeared to be chemically destroyed. They constitute a group of acute cases of the severest types—cases most urgently needing relief. They had resisted medical treatment. They had continuous elevation of temperature, the pulse rate varied from  $120^{\circ}$  to  $160^{\circ}$ , the heart was dilated, and all were acutely toxic at the time of operation.

We apparently had not the slightest control over their destiny. During this time we were operating with splendid success on subacute cases of Graves' disease,—old colloid goitre with added Graves' disease.

At this time we were fortunate in finding in our laboratories two dogs with unmistakable Graves' disease. They exhibited extreme nervousness, muscular weakness and tremor, a daily range of elevation of temperature, marked gastro-intestinal disturbances, diarrhœa and emaciation. The thyroids gave a distinct thrill and were large, soft and vascular. No exophthalmos was noted, but as this is not always a symptom

of Graves' disease in the human being it may not be a necessary symptom in dogs. These dogs, therefore, having tachycardia, temperature curve, loss in weight and muscular strength, an increased appetite and thirst, gave a good picture of Graves' disease. They furnished an unusual opportunity for carrying out a course of experiments. Each dog was observed for several days to determine as nearly as possible his daily phenomena. The animal was then subjected to various forms of psychic excitation, such as fear and anger. One animal was thrown into a state of marked excitement by fear. When he was frightened either with a whip or in various other ways, he would show, after about six hours, a marked rise of temperature, increased tachycardia, trembling, gastro-intestinal symptoms and even diarrhoea. The temperature then gradually fell, the mental symptoms subsided and the tachycardia diminished and the dog returned to his former condition. It was found that anger in the absence of fear also caused toxic symptoms. Following these forms of excitation the animal exhibited symptoms comparable to those occurring in the human being with Graves' disease. To make the parallel closer we planned anæsthetizing the dog, in the ordinary way, after first exciting him. Following this the dog showed very marked hyperthyroidism. After three days' rest the dog was given morphine half an hour before the anæsthetic, the latter was very gently administered and continued for the same period and under like conditions as in the former experiment. The dog showed no symptoms whatever of hyperthyroidism. In our judgment these experiments were parallel to the different methods of carrying out anæsthesia and operation upon human patients with Graves' disease. After repeating these experiments and performing similar ones on normal dogs, until it was obvious that we could produce a state of hyperthyroidism by psychic excitation, we then tried to produce similar symptoms by injecting in various doses the juice of thyroid glands which had been expressed by means of the Buchner press. This juice was given hypodermically at different times and in vary-

ing doses to the two Graves' dogs and to normal dogs, so that, in all, 10 dogs were injected. The effect upon the two groups of animals following the injection was very marked. In the dogs with Graves' disease the symptoms appeared earlier and lasted longer and with greater severity than in the normal dogs. In them an injection caused a rise of temperature, appearing after six hours and continuing from three to four days and in one case 10 days. The symptoms in all of the dogs following the injection were those of hyperthyroidism, but they were more marked in the dogs with Graves' disease than in the normal. As a control the juice from a number of other organs, namely, the kidneys, liver, etc., was administered in 20 times the dosage of that of the thyroid juice, but it was found that it produced no symptoms that could be confused with those of hyperthyroidism. The observations were carefully made, the laboratory was kept open day and night, every two hours observations were taken, and there was little chance for error.

These experiments in the laboratory corroborated clinical observations previously made and we formed the following hypothesis: that in Graves' disease the most powerful factor producing hyperthyroidism is psychic excitation; that in some way, either directly or indirectly, psychic excitation discharges into the circulation an excessive amount of thyroid secretion, which, in itself, may cause death; that the greatest factor in the mortality is not the operation *per se*, if well done, but what has occurred before the operation. In other words, at the time the surgeon makes his first incision the fate of the patient has been already sealed.

If, then, Graves' disease is surgically curable, and if one of the greatest factors in the surgical risk is psychic excitation, the operation should be performed without the patient's knowledge. Such an operation was accordingly planned and found to be readily accomplished by securing from the patient consent to enter the hospital to be treated either medically or surgically as I thought best, without further discussion. On entering the hospital a non-operative routine treatment is first



employed The object of this treatment is that of minimizing the disease phenomena and studying the case In addition to the routine, consisting of baths, diet, etc., every morning my trained anæsthetist, who is gentle and tactful, goes through the complete form of administering anæsthesia under the guise of inhalation treatment On the ether mask are dropped solutions of volatile oils The patient's friends are told that the date of operation would be determined by the patient's condition The clinical phenomena in these cases run an uneven course Within a few days or a week we usually recognize the cycles of the disease In the optimum portion of this cycle operation is performed The evening prior to operation the patient is given bromides, in early morning if the conditions are favorable for operation a hypodermic of morphia is given The shades of her room are kept drawn and absolute quiet maintained In this manner the patient is brought as nearly as possible to a negative psychic state The operation is done at an early morning hour At this time the anæsthetist repeats the so-called inhalation treatment The volatile oils are again dropped on the cone and the patient is told that this inhalation will be stronger, and that possibly a sore throat may result, but that the doctors say that this will be the last inhalation required Gradually the ether is added drop by drop and imperceptibly the patient passes into the second stage of anæsthesia She is then promptly sent to the operating room, and the operation is performed in the usual way The only change recently made in the technic is that of securing the blood vessels by means of a long needle threaded with catgut, at the four poles of the gland tissue near the posterior capsule, leaving a portion of the gland After tying these four ligatures the principal blood supply of the gland is controlled The gland tissue is then cut away leaving only portions of each lobe After this the raw surface is treated with very hot water, almost boiling, to control and destroy the superficial secretion and minimize oozing The operation is performed with the least possible trauma upon the gland The results are best appreciated by placing them in contrast

with those of other methods and with those following operations for other affections of the gland

Among 225 operations upon the thyroid gland 142 were for benign tumors or hypertrophies. Among these there was but one death. Among 28 cases of Graves' disease operated prior to the adoption of the present method the mortality rate was four. In the 13 cases operated by the new method, all of which were of a fair or a high degree of intelligence, and nine of which were of the severe toxic type, we succeeded in every instance in performing the operation without the patient's knowledge. The pulse rates prior to and during the anæsthesia and operation showed but little change. Sometimes the pulse rose a little, at other times it fell. The usual abrupt circulatory changes attending operations for this disease did not appear. Four of these cases were of the bed-ridden type, manifesting a running fever, a pulse rate from 120 to 170, acute dilatation of the heart, acute gastro-intestinal disturbances, and violent psychic storms. They were no less severe than the four fatal cases previously mentioned. There was the usual post-operation goitre rise in temperature and in pulse rate, but all of the cases made good recoveries.

*Summary*—There is evidence to show that the thyroid gland may discharge a pathological amount of its secretion in response to psychic excitation. This does not imply an explanation of the etiology. The symptoms of Graves' disease partially or entirely disappear after the removal of a sufficient amount of the thyroid gland. The psychic factor is the most important in the surgical risk. This factor may be eliminated by "stealing" the gland. When eliminated the operative risk seems to be greatly reduced.

# TREATMENT OF PERFORATIVE PERITONITIS \*

(GENERAL FREE SUPPURATIVE)

BY JOHN B MURPHY, M D,

OF CHICAGO, ILL.,

Professor of Surgery in the Northwestern University

THERE are no stomata or stigmata in the peritoneum, the endothelial lining is everywhere continuous. The importance of the peritoneum lies not so much in its great surface (17,182 square inches—nearly the same as the skin) as in its tremendous power of absorption, especially marked in the diaphragmatic and omental areas. Both the lymphatics and the blood vessels absorb fluids and soluble substances, while solid particles (bacteria, etc.) are absorbed almost entirely by the lymphatics. The peritoneal fluid has great bactericidal properties. Foreign bodies are encapsulated by the fibrin.

There are three forms of peritonitis: chemical, mechanical and bacterial. By the first is meant cases apparently without microbes.

As regards etiology, the sources of infection in over 90 per cent of the cases are the vermiform appendix and the pylorus. An important rôle is played by the *Staphylococcus albus*,—it appears first and disappears last. Then come in the order of importance the colon bacillus, streptococcus, pneumococcus, pyocyaneus, typhoid bacillus, gonococcus, *S. aureus*, etc.

As pointed out by the author in 1896, there is early acceleration of absorption in peritonitis with slowing later on. If we can but tide our patients over this period of accelerated absorption, all will be well. It is probable injections of nuclein, etc., before opening abscesses or infected hollow viscera, will, in the near future enable us to increase the resisting power of the patient.

The term "free" peritonitis should be used for the general, diffuse variety, and "circumscribed" for the encapsulated form regardless of size.

A typical case has pain at the onset, with nausea, tenderness,

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\* Abstract of paper read before the American Surgical Association, May 4, 1908

fever, Hippocratic facies, abdominal rigidity, vomiting and symptoms of collapse. The last is always a late, never an initial symptom.

There is probably no disease, not excepting diphtheria since antitoxin has been discovered, in which changes in treatment have reduced the mortality percentage so noticeably as the modern treatment of general septic peritonitis.

The importance of the Fowler position both pre- and post-operative is underestimated. The patient should be placed in this position as soon as the diagnosis is made and kept so until convalescence is well advanced.

The relief of pus tension is the first surgical step toward retarding absorption in all acute infections. Reduction of tension must be initial and the absence of pressure continuous—these are accomplished by drainage. The entire technic of these operations for peritonitis must be accomplished in a very few minutes, *i e*, get in quick, get out quicker.

The proper method of administering proctoclysis (Murphy) depends on close attention to details. The retention of fluid in the colon depends entirely upon the method of administration.

Opium and coal-tar anodynes were never given in the present series of cases either before or after operation.

Ileus is a frequent and often dangerous and very annoying symptom. In the 51 cases referred to there were 6 of post-operative ileus. Of the 51 cases operated on, two were gastric perforations, 1 duodenal, 5 typhoid and 43 appendiceal. The 16th and 46th cases died, the first from a double pneumonia on the 6th day after operation, the last from a mechanic ileus.

The severity of these cases is shown by the fact that 7 had to be re-operated for circumscribed accumulations of pus in various parts of the abdomen, which with the 6 of postoperative ileus makes a total of 25.7 per cent of cases requiring a second operation.

There were no fecal fistulæ. The time elapsing between the perforation and the operation varied considerably. In the duodenal case it was 8 hours, in the gastric cases it was 8 and 14 hours respectively. The time of perforation in the appendiceal cases was based on the sudden increase in pain, enlargement of inflammatory zone, nausea and vomiting, superposed on the already existing symptoms. On this basis a period of 40 hours

was not exceeded from the time of operation while many of them had suffered from the appendicitis for 3, 4 up to 7 days. The earliest operation was three hours after the perforation symptoms, the latest 40 hours, with an average of 22 to 30 hours.

Much of the credit for the good results is due to the family physician, as early diagnosis and early intervention are indispensable to success.

There were no deaths in the series of 51 cases from the peritonitis *per se*. When the plan of treatment outlined was first instituted the recoveries were believed to be coincidences. The number is now so large, however, and the results so uniform, it must be concluded they are legitimate sequellæ of the treatment. The results cannot be attributed to a change in the virulence of the infection, nor to any change in the patient's resistance of the individual or local immunity.

Based on the facts cited in the paper, it is believed the results in the future in these cases of general, diffuse, free peritonitis can and must be uniformly good.

This estimate involves the assumption that the medical profession will make early diagnosis, will insist on early intervention, will limit its surgical procedures to the least possible handling and trauma consistent with closure of the opening and relief of pus tension, will limit the duration of anæsthesia and the amount of the anæsthetic, will shorten the actual time of operation, will insure the continued absence of pus tension, will eliminate the sepsis already in the blood, restore the blood pressure and will inhibit absorption by position.

None of the above can be considered individually as a life saver, but each plays an important rôle in securing the present good results.

## LATE RESULTS AFTER OPERATIONS FOR BENIGN DISEASES OF THE STOMACH AND DUODENUM.\*

BY B G A MOYNIHAN, M.S., F.R.C.S.,  
OF LEEDS, ENG

IN endeavoring to arrive at a just estimate of the value of surgery in its application to the non-malignant diseases of the stomach I have gathered together the records of all the cases upon which I had operated up to the end of 1905. They are 281 in number, and may be classified into four groups

I Perforating ulcer of the stomach or duodenum,

II Cases for which hemorrhage has been the immediate cause of urgent interference,

III Cases of chronic ulcer, etc.,

IV Cases of hour-glass stomach

A printed form of detailed enquiry was sent out in the early part of this year to all the medical men who had very kindly referred these patients in the first instance to me. Of the 281 patients recent information is at hand in reference to 265 cases. The work of summary, analysis, and criticism has been very kindly undertaken for me by my colleague, Mr Harold Collinson.

GROUP I—*Perforation of the stomach or duodenum*  
During the period mentioned, that is, to the end of 1905, I operated upon 27 cases of perforating ulcer, 18 patients recovered. In 6 cases gastro-enterostomy was performed immediately after the closure of the ulcer because of the narrowing at or near the outlet of the stomach, which this procedure had caused. One of the cases died and 5 recovered. In 2 patients symptoms due to a cicatricial stenosis near the pylorus developed within a few months, and gastro-enterostomy was necessary to afford relief. In one patient I have recently had to operate four years after the closure of a perforating ulcer, which had caused a contraction in the centre of the stomach.

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\* Read before the American Surgical Association, May 4, 1908

Gastro-enterostomy was performed to the greatly hypertrophied cardiac pouch of an hour-glass stomach. In 8 cases, therefore, in a total of 18 who recovered, the operation of gastro-enterostomy has been necessary. All these cases are now reported to be quite well. In the remaining 10 cases the ulcer was placed on the lesser curvature, and in the cardiac half of the stomach in 9 instances, in one it was "prepyloric." Eight of the 9 patients are now quite well and make no complaint of stomach symptoms, from one patient nothing has been heard. The patient whose ulcer was prepyloric complains of indigestion and occasional vomiting and will probably need gastro-enterostomy.

The present condition of these patients is interesting in reference to two points. In the first place it is suggestive of the need for gastro-enterostomy in all cases of a perforating ulcer placed at or near the pylorus, in a position where the subsequent contraction in healing is likely to cause stenosis. In the second place it makes it evident that when an ulcer is placed near the lesser curvature and away from the pylorus, its excision or infolding suffices to give complete relief. Gastro-enterostomy in such circumstances is therefore not necessary at the time the perforation is treated nor is it likely to become necessary at a later stage.

GROUP II—*Acute hemorrhage*. In the series of hemorrhage cases there were 27 patients submitted to operation, of whom 23 recovered and are alive now, reports as to their present state of health have been received from 22. One patient, who was admitted to the hospital from prison, cannot now be traced. Eighteen are reported as being "perfectly well," "cured," "absolutely cured", in each one a complete restoration to health, good digestion and normal appetite has occurred. One case is improved in health but is rather delicate. His medical man reports, "the operation was for urgent and grave hæmatemesis and undoubtedly saved the patient's life, but he is still as he was before—weak and frail. There are no symptoms of dyspepsia." Three patients have suffered from post-operative vomiting. Two of the cases reported upon in Janu-

May and March, 1903, had the posterior long-loop operation; in one vomiting of bile occurred infrequently for a year and then disappeared, the patient is now "quite well", in another it has continued at intervals of 2 or 3 weeks up to the present time, the patient moreover says that she is "far better" than before and "able to work now". In the third case the no-loop operation was performed, the jejunal direction being downwards and to the right. This case is to me the most interesting of all, for it is the only case in which after the no-loop operation any bilious vomiting has occurred. The operation was in February, 1905, upon a patient seen with Dr. Nicholson Dobie and the late Dr. Dreschfeld. Bilious vomiting occurred every week or two up to 3 months ago, when it disappeared after repeated lavage. In this case after the anastomosis was completed it was noticed that the jejunum did not fit well, it seemed to be twisted above the point of union with the stomach, a remark to this effect is made in the notes written by my assistant on the day of operation.

GROUP III — *Cases of chronic gastric and duodenal ulcer, etc.* The patients in this class number 205, among them were 2 fatal cases, and 214 operations. For the purpose of analysis I have adopted the following classification

	CASES	DEATHS
<i>A</i> Gastric ulcer, duodenal ulcer singly or together	174	2
<i>B</i> Cholelithiasis with ulcer	4	0
<i>C</i> Cholelithiasis causing obstruction	6	0
<i>D</i> No demonstrable ulcer	11	0
<i>E</i> Pyloroplasty	3	0
<i>F</i> Secondary operations, the primary performed elsewhere	7	0
<i>G</i> Secondary operations in cases in classes <i>A</i> and <i>E</i>	9	0
	<hr/> 214	<hr/> 2

*Class A* — There are 174 cases—74 males, 100 females

Gastric ulcer alone	39 males	83 females
Duodenal ulcer alone	21 males	8 females
Gastric and duodenal ulcers	14 males	9 females

In this group a demonstrable ulcer was found in every instance. The number of duodenal ulcers was relatively very



small in the earlier cases but has gradually increased. Latterly I have operated more frequently for duodenal than for gastric ulcer, and think it not improbable that many cases in which the lesion was formerly supposed to be in the pylorus were incorrectly classified.

*Class B*—Four patients in whom ulcer was associated with cholelithiasis, three ulcers were gastric and one duodenal, and in all posterior gastro-enterostomy was performed. In three cases cholecystotomy was performed at the same time. In one case an operation had been performed 12 months previously for cholecystitis and stone in the cystic duct. Subsequently cholecystectomy was performed and a calculus removed from the common duct.

All the patients recovered and are cured.

*Class C*—In six cases, cholelithiasis, or its results, were found to be interfering with the proper action of the stomach. Five patients were females, one was a male. Of these six cases, two had had cholecystotomy performed before, and adhesions had caused pyloric narrowing. In one of these, a gastro-enterostomy had also been done with the aid of Murphy's button. The stomach symptoms returned after a year, and on reopening the abdomen it was found that the anastomosis was almost closed. A second gastro-enterostomy by suture was therefore performed.

In the remaining four cases, posterior gastro-enterostomy and cholecystotomy were performed three times, and cholecystectomy and gastro-enterostomy once. All the patients recovered and are cured. In all these cases the adhesions which existed between the stomach or duodenum and the bile-passage made it impossible to say whether ulceration in these viscera existed. In all probability, ulceration was present, or had been present, in every case.

*Class D*—In 11 cases, 10 primary and 1 secondary, no demonstrable ulcer was found, all the patients were females. In two of these hæmatemesis has occurred, and in several the stomach is described as being "dilated." In one case death occurred two days after operation from uræmia, and ulcer-

ation without induration was found in the duodenum, probably uræmic in origin and of very recent occurrence

In 3 cases the patients are now quite well In 6 cases the patients are no better, and in one improvement is "doubtful"

*Class E*—In 3 cases pyloroplasty was performed In all gastro-enterostomy had subsequently to be performed 5 months, 4 years, and 7 years afterwards

*Class F*—There were 7 secondary operations, the primary being performed elsewhere The following table gives the details

First Operation	Abnormal Condition	Second Operation
Posterior gastro enterostomy with Laplace's forceps	Opening closed, return of symptoms	Posterior gastro enterostomy with Murphy button
Posterior gastro enterostomy	Long loop, regurgitation	Entero anastomosis
Posterior gastro enterostomy	Hernia into lesser sac	Reduced Lateral anastomosis
Posterior gastro enterostomy	Long loop, regurgitation	Entero-anastomosis
Posterior gastro enterostomy	Long loop, regurgitation	Roux's operation
Posterior gastro-enterostomy	Return of symptoms, opening too small	Gastro-enteroplasty
Pyloroplasty, three cases	Pyloric stenosis	Posterior gastro enterostomy

*Class G*—There were 8 cases of secondary operations, the primary having been performed by me The following table shows the details

Previous Operation	Abnormal Condition Found	Secondary operation	Result
Gastro-enterostomy with Murphy button	Opening closed	Post gastro-enterostomy	Cured
Posterior gastro enterostomy	A long loop	Roux's operation	Cured
Posterior gastro enterostomy	A long loop and a small opening	Roux's operation and gastro-enteroplasty	Improved
Anterior gastro-enterostomy	Adhesions causing obstructions below the anastomosis	Lateral entero-anastomosis	Cured
Posterior gastro-enterostomy	Nothing abnormal, no lesion of any kind	Exploratory	No benefit
Posterior gastro-enterostomy	Adhesions constricting distal limb	Enteroplasty	Improved
Gastrostomy	Many adhesions and ulcer in duodenum	Posterior gastro-enterostomy	Cured

In addition two of my cases were subsequently operated upon by other surgeons. In one case a hernia into the lesser sac was found and reduced, in another some adhesions were found and were separated.

*Postoperative vomiting* occurred in 22 cases, 19 primary operations and 3 secondary.

*Class A*—Postoperative hæmatemesis occurred in two cases, in one a pint of blood was vomited within 24 hours of operation, no ill result followed. In a second, hæmatemesis occurred after the patient's return home on several occasions, this was a secondary operation, and no lesion was visible when I explored.

*Class B*—Regurgitant vomiting of bile necessitating early operation. One case. Profuse vomiting for 3 days, quite relieved by entero-anastomosis.

*Class C*—Later regurgitation due to a loop and relieved by secondary operation. Two cases treated by entero-anastomosis.

*Class D*—Cases in which vomiting occurred early and has now ceased. Seven cases, treated for a time by lavage with complete relief.

*Class E*—Case in which vomiting still occurs. Eight cases, all were operated upon before 1905, and in all a long loop of the jejunum was left.

*Class F*—Vomiting of food occurs now. Two cases. In both the symptom was frequent before operation and has not been relieved.

Ulcers were found on the lesser curvature in 8 cases, gastro-enterostomy was performed in 7 and excision in 1. In 3 cases carcinoma occurred later in the site of what was supposed to be a chronic ulcer, and in all proved fatal. In one only slight improvement has followed the operation, in the remaining cases the patients are now quite well.

#### LATE RESULTS

In 14 cases no report was furnished in 1908, but in 11 of these the patients were seen by me over two years after opera-

tion, and I have notes to say that all were well, in 3 cases no report can be obtained

In 12 cases the patients are reported to be "no better" or "about the same" In 6 of these cases, all women, no ulcer was found at the operation, nor any evidence of obstruction One of the cases was a secondary operation by myself, the primary operation having been performed elsewhere I found no lesion of the stomach and closed the abdomen without doing anything further There has been no relief from the symptoms, pain and hæmatemesis In another case the lesion was very slight, a small scar only being found on the posterior surface One case is an example of Finney's operation Three suffer from vomiting but are kept fairly comfortable and free from symptoms by lavage

In 5 there has been complete relief from the symptoms for which the operation was done, but in all there is slight very occasional vomiting, chiefly of bile The intervals of this vary from "2 to 3 weeks" to "every few months" In all the patients have returned to work, eat well, have gained weight, and attribute the onset of the vomiting to slight or grave indiscretions in the matter of diet In 4 of the cases the patients are "well satisfied" with the result of the operation, though their surgeon does not share their feeling of content

In 10 cases the improvement is doubtful or has been tardy Three of these were secondary operations, the original operation being done elsewhere One patient was well for 2 years, then began to lose weight and to become progressively more and more anæmic He died 4 months later of "pernicious anæmia" In one case of duodenal ulcer with the most intense hyperchlorhydria, there was a recurrence of symptoms one year later, and at a second operation elsewhere some adhesions and a jejunal ulcer (?) were found The patient recovered and improved subsequently The remaining patients have still some of their former symptoms, and usually have to make occasional calls upon their medical men The chief symptom that remains is vomiting In all the ulcer

found was small and at some distance from the pylorus, in the body of the stomach or on the lesser curvature

Eight patients have died since operation of diseases apart from those of the stomach. One  $6\frac{1}{2}$  years later of carcinoma of the pancreas, one 6 years later after operation by another surgeon for carcinoma of the cæcum, one 8 months later of acute pneumonia, one 4 years later of cardiac disease, one 3 months later of acute abscess of lung, one 1 year later of cardiac disease, and one 2 years later of pernicious anæmia. In one case the cause of death three years later is not mentioned.

In 7 cases death occurred from malignant disease of the stomach occurring at the site of the ulcer. The deaths occurred 2 years, 4 years,  $2\frac{1}{2}$  years,  $3\frac{1}{4}$  years, 1 year,  $1\frac{1}{2}$  years,  $2\frac{1}{2}$  years subsequently. The deaths in these cases are very significant. The intervals in most of them between operation and death, suggests that the condition present at the time of the operation was not then malignant, but rather that a carcinomatous invasion of the diseased part occurred at a later period. They were, perhaps, examples of *ulcus carcinomatosum*. There can be no doubt that in some of these cases Rodman's operation,—excision of the ulcer-bearing area,—would have been the better procedure.

Two patients died as the direct result of the operation, one from uræmia, one from acute obstruction due to hernia of all the small intestine into the lesser sac, and strangulation at the margin of the opening through the transverse mesocolon.

The final results in this group may be briefly stated thus

*Living*—Cured, 18, relieved, 5, doubtful, 9, no better, 12, no recent report, 14 (11 of these may be considered certainly as cured)

*Dead*—As result of operation, 2, of carcinoma of stomach, 7, of other causes, 8

Total number of cases, 205

GROUP IV—*Cases of hour-glass stomach*. There were 22 cases, comprising 7 males and 15 females. In every case

there had been previous symptoms pointing to chronic gastric ulcer. In 4 cases the history is strongly suggestive of a former "subacute" perforation, while in a third case the urgency of a perforation indicated operative measures.

The total mortality is three—one on the fourth day, from septicaemia, resulting from a strangulated rectal prolapse, 1 in the third week, from suppression of urine, 1 on the fifth day, from pneumonia.

The ulcer in the stomach was associated with duodenal ulcer in 2 cases (1 male and 1 female).

In 1 case a pancreatic cyst was also found at operation. Adhesions to the anterior abdominal wall were met with in 4 cases. Trilobed stomach was seen once.

The following operations were performed: Gastro-enterostomy alone 7 times, 1 death. Gastrogastrostomy and gastro-enterostomy 3 times. Gastropasty alone 7 times, in 2 secondary operations were necessary. Dilatation of stricture, once. Gastropasty and gastro-enterostomy twice, one death. Gastrogastrostomy alone, once. Gastro-enterostomy and Loreta's operation once, the patient died.

*Results*—Twenty-two cases, 3 deaths, 3 secondary operations (gastro-enterostomy) for return of symptoms, 1 secondary operation, entero-anastomosis for regurgitant vomiting after gastro-enterostomy.

One patient has since died of puerperal fever. Recent reports have been received from 17, all of whom are quite well, of one no report has been heard.

A summary of the entire number of cases gives the following results:

	TOTAL NUMBER	RECOVERED	DIED	SINCE DEAD	CURED
Group 1	27	18	9	0	16
Group 2	27	23	4	0	19
Group 3	205	203	2	15	159
Group 4	22	19	3	1	17
	<hr/> 281	<hr/> 263	<hr/> 18	<hr/> 16	<hr/> 211

The present condition of all the patients now alive is as follows 211 patients are cured, 9 patients are improved, 12 patients are no better, 9 patients are doubtful, 6 patients not recently reported, total, 247

Thirty-four patients are dead, 18 as a result of the operation, 7 of carcinoma of the stomach, 9 from other causes unconnected with the disease of the stomach, or the operation performed for its relief

Such is a brief review of the after-history in all my cases What are the lessons to be learnt therefrom? I submit the following points

1 The operative treatment of stomach disorders should be confined exclusively to those cases in which an organic lesion is present Unless there is a palpable and demonstrable ulcer in the stomach or in the duodenum or some condition which hampers the proper action of the stomach the symptoms are not due to any pathological cause capable of being relieved by surgical interference However careful our preliminary investigations may be we shall from time to time display upon the operation table a perfectly normal stomach We must not then endeavor to cover our diagnostic disaster by the performance of an unnecessary operation upon the stomach but rather must we candidly confess that our exploration has proved negative To perform gastro-enterostomy in such cases has, I think, been proved to lead to unsatisfactory results, whereby the operation is discredited

2 In cases of acute perforating ulcer, the perforation should be closed or the ulcer excised When the ulcer lies upon the lesser curvature nothing more is necessary than this The after-history of such cases shows that they are relieved from all disabilities referable to the stomach When the ulcer is prepyloric, pyloric or duodenal, gastro-enterostomy also should be performed It doubtless hastens the immediate recovery of the patient by affording an easier exit from the stomach than that impeded by the ulcer, and it forestalls the almost certain onset of symptoms which only a short-circuiting operation can relieve

3 When a non-malignant lesion is discovered the treatment appropriate to it depends upon its position in the stomach. If an ulcer be placed on the lesser curvature at some distance from the pylorus, in such a position that no obstruction is offered to the onward passage of the food, excision should be performed. In such cases the relief from gastro-enterostomy may be incomplete and it is probable that the later onset of malignant disease occurs in a large proportion of cases. In some cases, however, when the ulcer is on the curvature or on the posterior surface of it adherent to the pancreas, relief follows if gastro-enterostomy is performed on the cardiac side of the lesion. It may be that the ulcer when anchored impedes the proper movements of the stomach, or that the nerve-supply being interfered with some local paresis of the gastric wall results.

4 If the ulcer be prepyloric, pyloric or duodenal, gastro-enterostomy should be performed. It is desirable also to infold an ulcer whenever possible, for both hemorrhage and perforation have occurred from ulcers for which gastro-enterostomy has been performed months or years before. The local treatment of the ulcer is always desirable and is generally easily performed.

5 The most satisfactory method of gastro-enterostomy is the posterior no-loop operation, with the almost vertical application of the bowel to the stomach. The vertical position is that into which the jejunum falls most easily in the normal (that is the erect) position of the body. A deviation to one or the other side if slight is of no importance, and entails no untoward consequences.

6 Regurgitant vomiting occurs as a result of the "loop" operation, whether anterior or posterior. It is relieved almost certainly by an entero-anastomosis. Patients who suffer from it may be relieved entirely of all symptoms for which they originally sought relief. An operation that is mechanically imperfect relieves the original disorder though it leaves serious disabilities behind it. The vomiting of bile may be relieved



by lavage and in some patients disappears entirely after the lapse of weeks or months or even years

7 In cases of hour-glass stomach the surgical treatment necessary presents special difficulties on account of the frequency of two lesions—one in the body of the stomach and one at the pylorus, and double operations have consequently to be frequently performed

# A STUDY OF GASTRIC AND DUODENAL ULCERS.\*

WITH ESPECIAL REFERENCE TO THEIR SURGICAL CURE.

BY WILLIAM J MAYO, M D.,

OF ROCHESTER, MINNESOTA

Surgeon to St Mary's Hospital, Rochester, Minnesota

THIS paper is limited in its scope to a discussion of gastric and duodenal ulcers with a view to presenting some facts as to their surgical cure. There seems to be much apprehension in the minds of the profession at large as to just what cases should be subjected to surgical treatment, and at what stage operation is to be recommended, if at all. In the following series the average duration of the pre-operative symptoms was over twelve years, and no patient was operated upon for ulcer until medical treatment had been tried over and over again without securing a permanent cure.

There is no conflict between medicine and surgery in this field, as only the cases that fail to yield to a *reasonable* amount of medical treatment should be considered surgically.

The physician is quite within reason in asking the surgeon as to the ultimate results of the operative treatment of gastric and duodenal ulcers. It is not enough that we show the mortality immediately following operation to be low, and the patient temporarily relieved, but two years of time at least should elapse after operation before the patient can be safely pronounced cured. The answer to the question is, however, not an easy one, as a number of factors must be taken into account.

In the earlier work some of the patients were not relieved because of technical errors which have now been corrected, and especially because gastrojejunostomy was, for a time, looked upon as a "cure all" and applied indiscriminately without regard to local conditions. In other instances of apparent

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\* Read before the American Surgical Association, May 4, 1908

failure the diagnosis was questionable, as the evidence that the disease was ulcer depended upon pre-operative clinical data, rather than pathological findings at the operating table

It can be said too that gastric and duodenal ulcers cannot be separated from their complications, so that no review would be complete on the surgical side without including obstructions, deformities, and limiting adhesions that interfere with the gastric function even after the ulcer itself has healed

It seems wise, therefore, to present at this time all the cases of ulcer and kindred diseases of the stomach and duodenum operated upon by Dr C H Mayo and myself since the first case in 1893, a period of fifteen years, but to confine the special investigation and statistics to the ulcer group

Total number of operations to May 1, 1908, 827, total number of patients operated upon, 768 Two hundred and twenty-five cases were operated upon for benign lesions other than ulcer and are classified in the following groups

I Adhesions and bands the result of ulcer

II Secondary infectious processes such as subdiaphragmatic abscess, etc, the result of perforating ulcer

III Cases apparently of inflammatory origin but in which evidence that the process was ulcer proved insufficient to classify them as such

IV Pyloric obstruction from contracture of the pyloric muscle, valve formation, etc, apparently not due to ulcer

V Bullet and stab wounds, other traumatisms and foreign bodies

VI Benign tumors, hypertrophic pyloric stenosis, syphilis and tuberculosis

VII In which the stomach was opened to obtain access to the cardiac orifice for cardiospasm and benign strictures of the œsophagus Gastrostomy, etc

VIII In which the duodenum was opened to obtain access to stones and tumors in the posterior wall of duodenum, papilla and ampulla of Vater

IX Obstructions and ulcerations of the stomach and duodenum caused by gall-stones

X Negative explorations of interior of stomach and duodenum

This leaves 540 cases operated upon for ulcer of the stomach and duodenum

#### ACUTE PERFORATIONS

There were 27 patients operated upon for acute perforations. In 5, primary gastrojejunostomy was also done, with two deaths. In 22, closure of the perforation was made with abdominal drainage, and but one of the 18 who recovered required a secondary gastrojejunostomy, the perforation having seemingly put an end to the disease.

Acting upon this observation, I have twice, in chronic gastric ulcer where the conditions were such that I could not excise and where gastrojejunostomy was not indicated, exposed the crater of the ulcer which in each case was found comparatively small but surrounded by a mass of indurated and scar tissue. With a sharp knife I cut out the base of the ulcer, thus producing the picture of acute perforation, then closed the defect. Just what the ultimate outcome will be I do not know, but the immediate results have been most favorable.

#### DEVELOPMENT OF THE SURGICAL TREATMENT OF CHRONIC ULCER

Our experience with the surgical treatment of chronic gastric and duodenal ulcers can be divided into three stages.

First, the period previous to 1900

Second, the period from 1900 up to and including 1905

Third, from 1905 to the present time

*First Period*—The surgery of chronic gastric and duodenal ulcers previous to 1900 might be called the surgery of benign obstructions, as the majority of operations were for gross lesions. The relief afforded by these operations was immediate and permanent in all but a few cases where technical failure to secure good gastric drainage was at fault. The operative mortality was about six per cent.

Two varieties of operations were employed Gastrojejunostomy and pyloroplasty Unfortunately one-third of our cases subjected to the pyloroplasty of Heimike-Mikulicz required secondary operation Gastrojejunostomy we then as now generally employed, but made it anteriorly with the Murphy button The character of the complications subsequent to this operation varied from the occasional dropping into the stomach of the button to the contraction of the opening due to the traction weight of the attached intestine at the point of anastomosis Volvulus of the loop and incarceration of the small intestine through the loop, each, however, accounted for the necessity of a secondary operation

At the meeting of the American Surgical Association, 1902, I reported seven of these mishaps, but in spite of technical errors, operations during this early period were very successful The Murphy button demonstrated the great possibilities of gastro-intestinal surgery and the occasional failure of the button stimulated efforts toward betterment of methods

We learned by experience that within reasonable limits the greater the obstruction the more certain the cure, and we also learned the value of having the opening in the stomach at the lowest point (ANNALS OF SURGERY, 1902), for we noticed that after the button was placed, all of those cases in which the traction weight on the anterior gastric wall caused a funnel to form gave successful results, and, as will be shown later, the majority have remained well up to the present time—from eight to fifteen years

*Second Period*—Stimulated by these early successes, the next six years were marked by the invasion of new fields, we were no longer contented to wait for starvation through obstruction to force operation, but rather attempted to forestall this final stage and by earlier operation terminate the disability, relieving the patient from the underfeeding and pain which are such marked symptoms of the malady

The results in this group did not compare favorably with the early period in which the problem was purely one of mechanics arising from interference with gastric drainage, or

with the third period in which technical errors had been largely eliminated and a sound pathological basis substituted for fallacious clinical observations,

The problem was approached with the knowledge gained from the operative treatment of obstruction, but when this was put into actual practice where there was no obstruction, it was very quickly found that the stomach was not a bag emptying itself by gravity, but a muscular organ which always propelled the food toward the pylorus, and that if the pyloric end of the stomach and the upper duodenum were not interfered with mechanically or otherwise by the presence of an ulcer, that the food would not pass out of the gastrojejunostomy opening, but in spite of it would continue through the pylorus. While this position was disputed at the time by eminent authorities, I believe that it is now generally accepted. In some cases, where the ulcer was situated at a considerable distance above the pylorus, a certain amount of benefit did occur, however, by reason of the passive drainage of the irritating gastric secretions through the artificial stoma during the period in which the stomach was fasting and inactive.

It was eventually discovered that ulcers which exist to the left of the pyloric end of the stomach should, if possible, be excised, but if in doing this deformity was created which would interfere with the progress of food, gastrojejunostomy should in addition be performed.

The excision of gastric ulcers was still further stimulated in that a considerable percentage of ulcers later degenerated into cancer. In 180 cases of our own in which part of the stomach was resected, cancer on ulcer base was demonstrated in 54 per cent. Ulcer of the duodenum seldom undergoes malignant metamorphosis, so that this indication for excision does not apply with the same force to duodenal ulcers.

During this second period great efforts were made to improve the technic of gastrojejunostomy. Where pyloric obstruction was present almost any method gave good results, but if no obstruction existed some of the biliary and pancreatic secretions were liable to enter the stomach, and this annoying

complication occasionally led to the necessity for an entero-anastomosis to check the disturbance

Roux, Doyen and others invented primary operations combining entero-anastomosis in some form with gastrojejunostomy, while Eiselberg proposed to artificially obstruct the pylorus, thinking to produce the favorable conditions known to be present in obstructions

The posterior operation gradually replaced the anterior as the popular method. The loop was eliminated, and we no longer turned the jejunum to the right, but sutured it to the stomach as it runs normally downward and to the left

We have made over 300 gastrojejunostomies for ulcers of the stomach and duodenum by this particular method with a mortality of less than one per cent, and but three cases have required a secondary operation upon the stomach for any cause

In all "loop" operations, anterior or posterior, the intestine is applied to the stomach downward and to the right, but in the "no loop" method we found that this sometimes caused angulation as it turned the jejunum at the duodeno-jejunal angle rather sharply from its normal position, and occasionally caused chronic bile regurgitation

The vertical attachment of the jejunum to the stomach as originally practised by Mikulicz with a transverse intestinal incision, and by Czerny with the Murphy button has been recently revived by Mr Moynihan, who is now using it with the longitudinal intestinal incision (ANNALS OF SURGERY, April, 1908)

Technical errors were, however, not the sole cause of failure to cure. The whole subject was pathologically undeveloped, we did not always know at the operating table whether ulcer was present or not, and we failed to differentiate ulcer from non-operative diseases of the stomach, and occasionally operated upon patients who would have been better treated otherwise. In the beginning we really had little exact knowledge of the living pathology of ulcer excepting its complications obstructions, perforation and hemorrhage. The clinical

symptomatology was based upon an erroneous pathology, teaching that chronic ulcer frequently confined itself to the mucous coat, consequently gastrojejunostomy was often done when no ulcer could be found, under the mistaken idea that an ulcer actually existed but was hidden in the interior of the stomach, and a number of patients whom the operation had failed to relieve because they did not have gastric or duodenal ulcer were recorded by both physician and surgeon as instances of operative failure to cure, instead of a *mistake both in diagnosis and operation*, which was the fact

In 14 cases of our own and a number in which the primary operation was done by other surgeons, we have re-operated for trouble of this description and often failed to find any trace of an ulcer, we have, therefore, in such cases, cut off the gastrojejunostomy and closed both sides, restoring the gastrointestinal canal to its normal continuity. Strange to say that following this temporary gastrojejunostomy nearly half of the patients were relieved of their original discomfort, but sufficient time has not elapsed for us to know whether this will be permanent

The Finney operation gave remarkably good ultimate results in pyloric obstructions, but in cases of unhealed ulcers existing proximal to or distal from the parts involved in this operation, less benefit was derived unless the ulcer lay within the zone of the operative field so that it could be coincidentally excised

The mortality of this second period was not greatly reduced, remaining at about five per cent, largely because a number of these patients had complicated operations, and in some instances several operations, which increased the mortality, but in spite of these developmental errors the large majority of true ulcers were relieved or cured as will be demonstrated later

*Third Period* —The third period covers about two and one-half years. The doubtful cases have been eliminated, and a living pathology established which enables the surgeon to recognize the ulcer at the operating table. If the ulcer is not



actually demonstrated, no gastric operation is undertaken unless necessitated by hemorrhage

Gastrojejunostomy is still our most valuable operation, especially for duodenal ulcer, which is the lesion in nearly two-thirds of our cases (Fig 1.)

The operation of Finney is chosen for pyloric strictures (Figs 2 and 3)

Ulcers in the stomach at a distance from the pylorus are excised (Figs 4 and 5)

If hour-glass contraction is present, the whole diseased area is excised (Figs 6 and 7.) If it is not possible to do this, proximal gastrojejunostomy is performed

Calloused ulcer of the pyloric end of the stomach indicates the operation of Rodman (Figs 8 and 9), consisting of resection of the diseased area with closure of the duodenum and independent gastrojejunostomy (Modified Billroth, No II, for cancer)

The mortality of even the more complicated operations does not exceed three per cent, while the cures will, I believe, run ninety-five per cent or over

#### SURGICAL CURES OF GASTRIC AND DUODENAL ULCERS

Three hundred and seventy-nine cases of gastric and duodenal ulcer were operated upon by us previous to June 1, 1906, consisting of 211 males and 168 females with an operative mortality of 4.8 per cent

In 64 of these no ulcer was actually demonstrated at the time of operation, the record stating that they were clinical, medical, or mucous ulcers, as they were then called

In some, slight points of apparent thickening were found, or spots where the mucous membrane did not "seem to glide on the muscular tunic as it should," and this was accepted as evidence, but in our later work actual search of the mucosa for such supposed lesions did not often show their existence

This brings up the important question Can *chronic* ulcer exist without visible and pronounced evidence in the walls of the stomach and duodenum? We must admit that this is a

Ulcer of the duodenum and gastrojejunostomy after the posterior "no loop" method Jejunum applied to the stomach as it normally runs to the left and downward

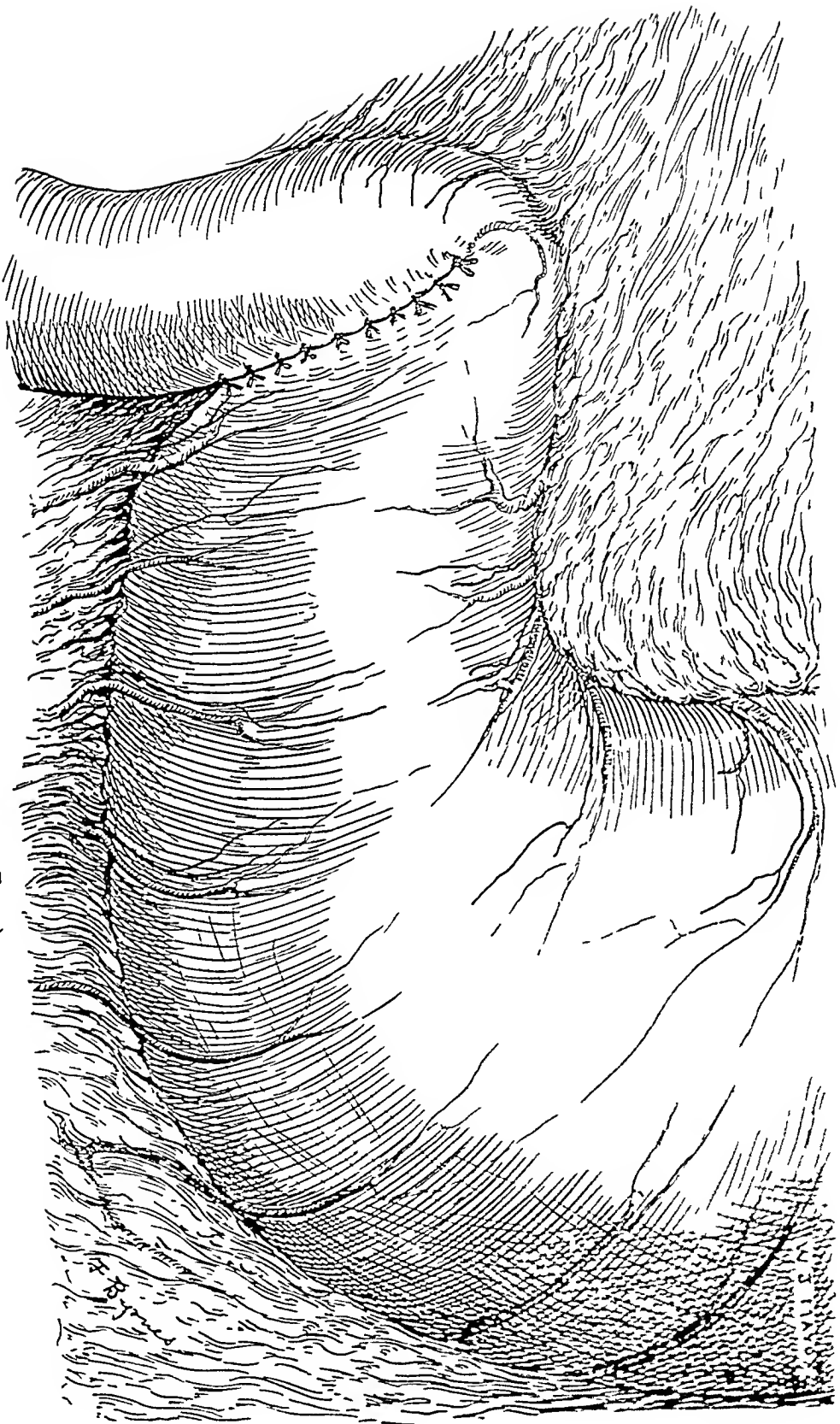


FIG. 2



Pyloric structure      Enney's gastroduodenostomy indicated

FIG. 3



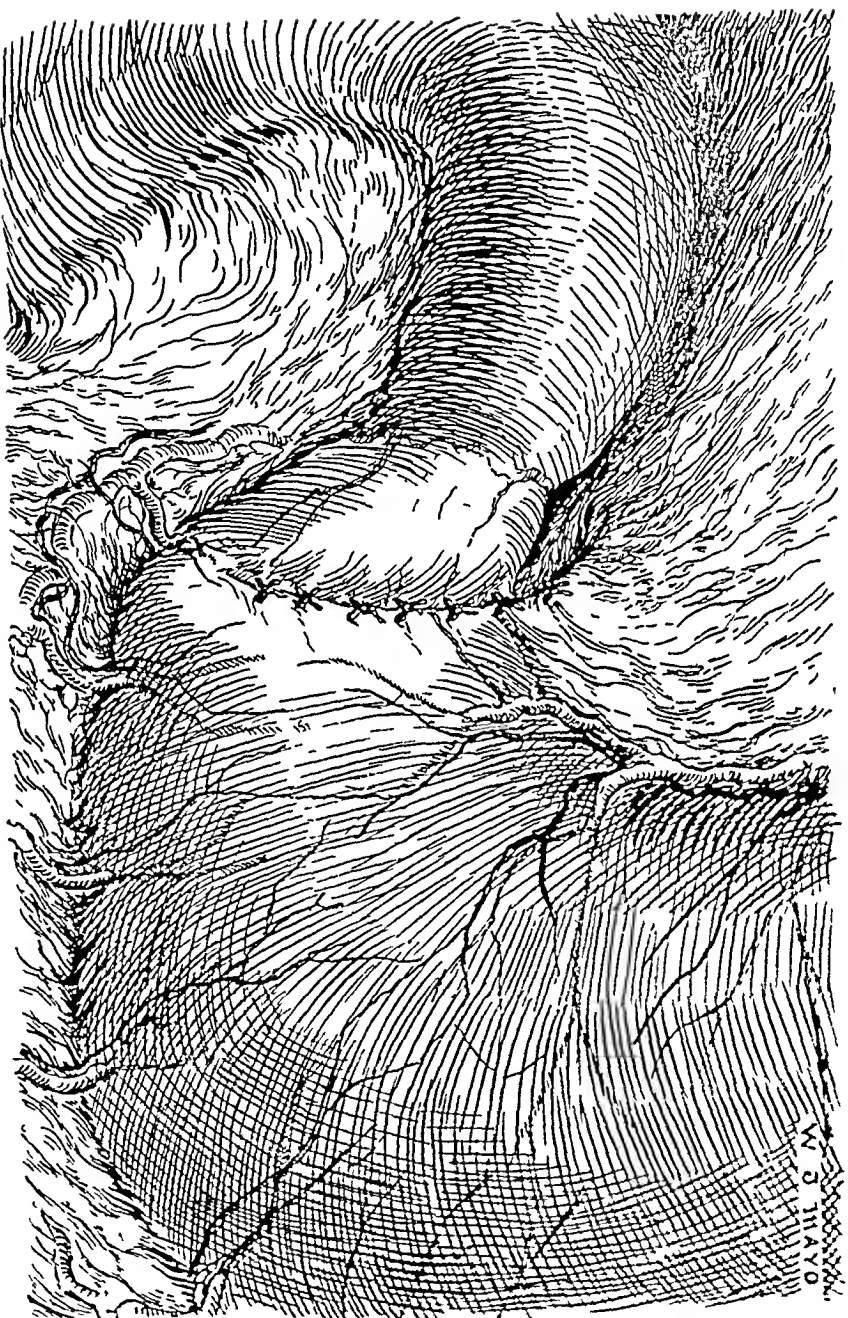
Result of Finney operation (See FIG. 2)

FIG 4



Saddle ulcer of the lesser curvature without crusting, serous obstruction and indurating excision (See Fig 5)

Fig. 5

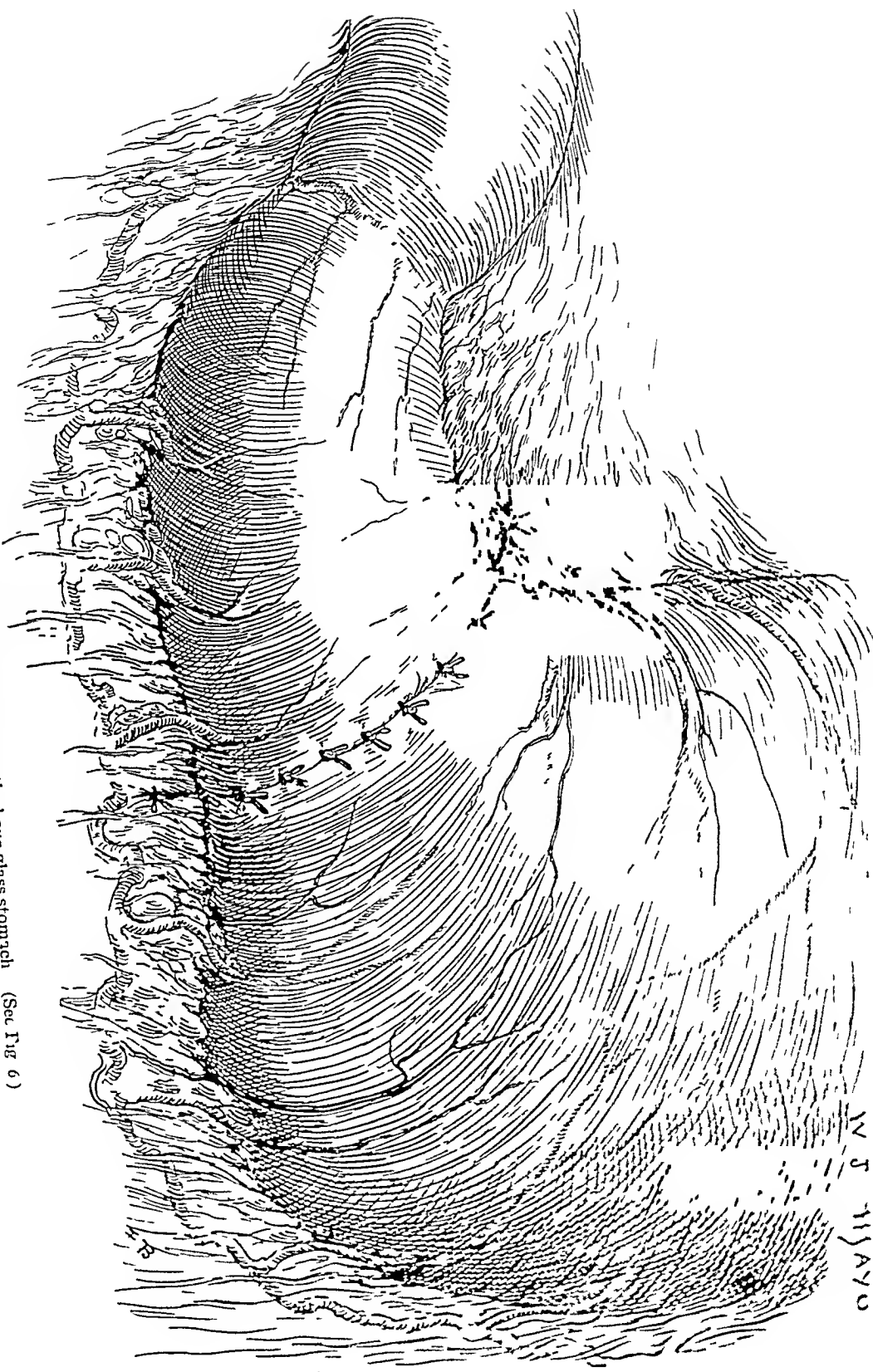


Result of excision of saddle ulcer (See Fig. 4)

FIG 6



Hour glassistomich Dotted lines show proposed resction (See Fig 7)



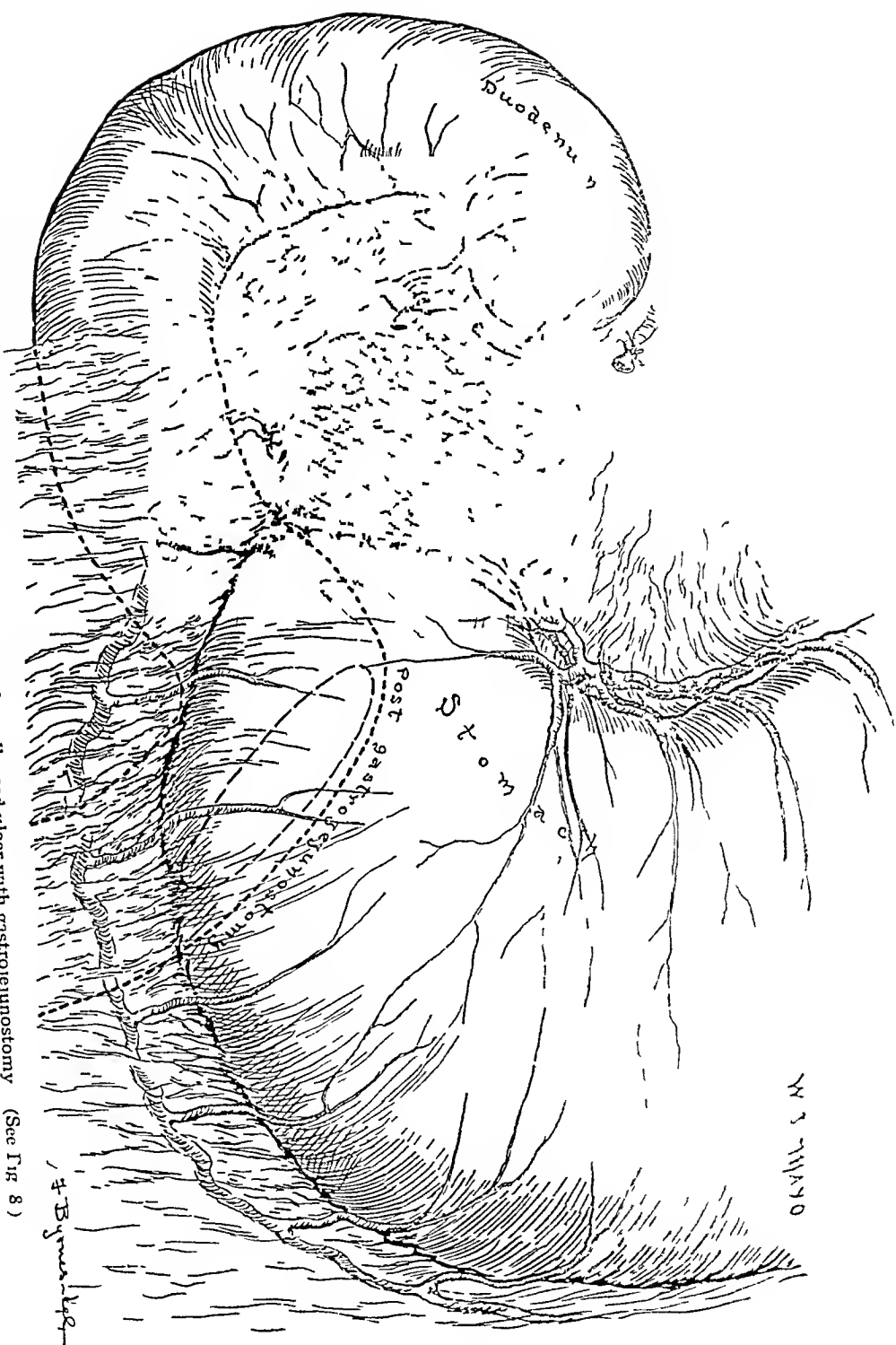
Result of resection of the obstructing ulcer in the hour glass stomach (See Fig 6)



FIG 8



Calloused ulcer at pyloric end of stomach Indicating resection (See Fig 9)



Result of Rodman's excision of pyloric end of stomach for caloused ulcer with gastrojejunostomy (See Fig 8)



rare possibility We have operated upon a few cases in which we were unable to detect an ulcer even after careful intragastric investigation when the history seemed to demonstrate that an ulcer was present

Eleven, or 17 per cent of the 64 patients, required supplementary operations at a later date In nine, no ulcer was discovered at the second operation, but in two an ulcer was found which had been previously overlooked It seems fair, therefore, to put all of these 64 cases, excepting the two just mentioned in which the ulcer was shown at the second operation, in a separate classification as questionable All of these were operated upon in the second period between 1900 and 1906 Since that time no questionable cases have been submitted to operation

Of this questionable group we have obtained knowledge of 50 Seventeen, or 34 per cent, were cured Fourteen, or 28 per cent, improved Sixteen, or 32 per cent, unimproved, and, 3 or 6 per cent, are dead, showing cured and improved 62 per cent

In the 318 cases of actually demonstrated ulcer, we have traced 234 Of these 189, or 80.7 per cent, are cured Twenty-one, or 9 per cent, improved, 10, or 4.2 per cent, unimproved, and 14, or 6 per cent, have died since the operation from various causes, in only two cases, however, was the cause of death connected with the stomach, showing a total of 89.7 cured and improved

In conclusion, let me say that ulcer patients need careful regulation of diet, etc, following operation, and should be under medical supervision until they have made a complete recovery

# END-RESULTS FOLLOWING OPERATION FOR BENIGN DISEASES OF THE STOMACH AND DUODENUM \*

BY JOHN B DEEVER, M D,

OF PHILADELPHIA, PA,

Surgeon in chief to the German Hospital

My being able to report the results contained in this paper has been made possible only by the careful and painstaking work of Dr A D Whiting, Assistant Surgeon to the German Hospital, who collected and tabulated the data and to whom I cheerfully give the credit

Empiricism, or the reliance on direct experience and observation rather than on theory, must be condemned, as a rule, in the scientific surgery of to-day There should undoubtedly be a reason for every step taken in surgery, there should be a theory back of every application of practical means used to afford relief from any pathological condition found in the human body The practical mind, however, is ever too prone to seek results rather than to explain how or why such results are obtained Practical experience must influence us to work more or less empirically, although it must be admitted that there is always a tendency to adopt a theory which is more or less in keeping with the results obtained—a theory that may be laid aside in a day, a month, a year This tendency toward empiricism has been especially marked in the operative treatment of some of the benign diseases of the stomach and duodenum Practical results are obtained, but why they are obtained in some conditions must be left for the future to definitely decide Hence it is that a study of end-results following operative interference in these diseases will give a better idea of the condition in which a stomach operation is indicated than would a study of the theoretical etiology of the

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\* Read before the American Surgical Association, May 4, 1908

conditions present, or a study of the theory underlying the results obtained

Stomach surgery is in its infancy. It has grown old enough, however, and has shown sufficient accomplishments, to make most investigators agree that certain pathological conditions to be found in that organ and the duodenum must be overcome by the surgeon rather than by the internist. The immediate results speak volumes, the end-results are far superior to any that can be obtained by other than operative means.

The principal benign diseases of the stomach and duodenum which are found in the realm of surgery to-day are ulcer, with its various complications, gastrectasis, whether due to pylorospasm, gastric myasthenia or pyloric stenosis, and stenosis of the pylorus, either with or without dilatation.

End results following operation for gastric ulcer do not always justify the picture so graphically portrayed by Kocher, but he undoubtedly is correct in the vast majority of cases when he says that "not only can the numerous dangers of ulcerating affections of the stomach, such as hemorrhage, perforation, transition into cancer, be prevented, but the disease and its results may be so rapidly and certainly cured that the medical treatment of obscure cases must be put in the background. The pain in the stomach disappears immediately after the operation. This is the invariable rule. The patient does not require to pay any further attention to the nature of his food. The vomiting disappears, the bowels become regular, there is progressive improvement in the process of digestion."

In gastric dilatation, gastric myasthenia, and ptosis of the stomach probably the most that surgery can do is to so alter the mechanism of the stomach and intestine that medical measures will become effective.

When there is pyloric obstruction, no matter what the cause, there is a definite procedure indicated,—namely, the establishment of a free and permanent communication between the stomach and intestine.

In these various diseases, practical experience has taught that the best results may be obtained by performing a gastroenterostomy. The choice of operation varies with different operators. Personally, I prefer the posterior gastrojejunostomy, when it is practicable, the no-loop-clamp method with excision of a portion of the mucous membrane. This procedure practically eliminates the danger of the so-called "vicious circle" and the use of the clamps minimizes the danger of leakage and infection during the operation. The end-results are just as good when the suture method is used with no loop, instead of the clamps, but the primary danger is greater than in the former method. The no-loop operation is a great advance over the long-loop, not only because the immediate results are better, but also because there is much less or practically no danger of a vicious circle being established even subsequently, as not infrequently was the case even when a primary enteroenterostomy was performed.

Patient No 2610, 1905, is a good example of this condition. Patient was a female, aged 40. She had been operated upon in 1900, the name of the operator not being ascertained, for ulcer of the stomach, a posterior gastrojejunostomy, long-loop, being performed with a Murphy button. For one year she was in good health with no stomach symptoms. During the year she gained 35 pounds. She then began vomiting intermittently, which continued with more or less regularity for three years. She was admitted to the German Hospital November 28, 1905, with persistent uncontrollable vomiting of stomach contents and bile. Operation, November 29, 1905. Ether anæsthesia. The gastrojejunostomy opening was patulous. The pylorus was partially occluded by an old scar. An enteroenterostomy with suture was performed, and the pylorus was ligated with silk. She made an uninterrupted recovery. February 11, 1908, two years and three months after the operation, she is in fairly good health, much better than before the operation, although she still complains of some stomach trouble. The no-loop operation practically eliminates all such cases from the surgeon's notice.

The operation of election should always be performed

when possible, the best possible procedure under the conditions present must be adopted when the operation of election is not feasible. A poorer and much less satisfactory method, the anterior gastrojejunostomy, should not be excluded entirely from the surgeon's list of procedures, as has been advocated by one of the best-known operators in the country.

Patient No 478, 1902, a male aged 40 years, furnishes a good example of what can be accomplished even by this procedure. He was transferred from the medical to the surgical wards of the German Hospital with a history of long-standing stomach disease, with pyloric obstruction. A mass in the pyloric region was easily palpable. Operation, March 10, 1902. Ether anaesthesia. Upon opening the abdomen a mass the size of a lemon was found occupying the site of the pylorus and causing almost complete occlusion. Extensive adhesions made it practically impossible to deliver the stomach sufficiently to allow of a posterior operation. An interior gastrojejunostomy was performed in the belief that the patient would be benefited by it. He made a rapid and uneventful recovery, most of his symptoms disappearing immediately. Five years and eleven months after the operation he is in good health, being absolutely free from all gastric symptoms. He has gained 36 pounds.

End-results will probably always be better when it is possible to perform the operation of election or choice, but relief in all instances must be afforded the patient, if it be at all possible, whether the method used be one of choice or one of necessity.

An analysis of the end-results in operation for benign diseases of the stomach and duodenum is of great interest to the medical profession of to-day, but it will be of greater value and interest to the operator of the future when the more improved methods of operation shall have had an opportunity to show their worth with increasing age. I have been able to trace 66 of the patients upon whom I have performed stomach operations for benign disease. Of this number 44 are free from all gastric symptoms, 9 are greatly improved,



5 are unimproved, and 8 have died. These figures give a percentage of cures of 66.6, of patients that were greatly improved, 80.3. From the operative view-point these patients were divided as follows:

Posterior gastrojejunostomy, long loop, suture. 7 cases traced, 6 of whom had no gastric symptoms 5 years 7 months, 5 years 3 months, 4 years 4 months, 2 years 1 month, and 1 year 4 months, respectively, after operation. One case died 4 years and 4 months after operation from unknown cause. Percentage of cures, 85.7.

Posterior gastrojejunostomy, long loop, suture, primary enteroenterostomy with Murphy button. 12 cases traced, 7 of whom had no gastric symptoms 4 years 5 months, 4 years 4 months, 3 years 4 months, 2 years 11 months, 2 years (moved to Ireland), 2 years 6 months, 3 years 2 months, respectively, after operation. One was improved 2 years 10 months after operation. Two were unimproved 3 years and 2 years 8 months respectively, after operation. Two cases died, both 2 months after operation. Percentage of cures was 58.3, of those improved, 66.6.

Posterior gastrojejunostomy, long loop, suture, secondary enteroenterostomy, Murphy button. 3 cases traced, 1 of whom had no gastric symptoms 4 years 6 months after operation. Two cases died, one 2 years and 2 months after operation, cause unknown, the other died 1 year after operation from obstruction of the bowel due to bands. Percentage of cures was 33.3.

Posterior gastrojejunostomy, long loop, suture, primary enteroenterostomy with secondary ligation of the pylorus. 1 case traced, no gastric symptoms 2 years 2 months after operation.

Posterior gastrojejunostomy, long loop, suture, secondary gastroduodenostomy and enteroenterostomy. 1 case traced, no gastric symptoms 1 year 6 months after operation.

Posterior gastrojejunostomy, no loop, suture. 25 cases traced, of whom 16 had no gastric symptoms 2 years 7 months, 2 years 4 months, 2 years, 2 years, 2 years, 1 year 11 months,

1 year 9 months, 1 year 8 months, 1 year 8 months, 1 year 7 months, 1 year 7 months, 1 year 7 months, 1 year 5 months, 1 year 4 months, 1 year 1 month, 1 year 1 month, respectively, after operation Four cases were improved 1 year 7 months, 1 year 5 months, 1 year 3 months, 1 year 2 months, respectively, after operation Three cases were unimproved 2 years 2 months, 1 year 6 months, 1 year 3 months, respectively, after operation One case died 1 year after operation, cause of death unknown Percentage of cures, 64, of improvements, 84

Posterior gastrojejunostomy, no loop, clamps 6 cases traced, of whom 5 had no gastric symptoms 1 year, 11 months, 11 months, 10 months, 6 months, respectively, after operation One case died 7 months after operation, there having been no improvement in the gastric condition

Anterior gastrojejunostomy, suture one case traced, no gastric symptoms 5 years 11 months after operation

Duodenorrhaphy, posterior gastrojejunostomy, long loop, suture, primary enteroenterostomy 1 case traced, no gastric symptoms 3 years 7 months after operation

Duodenorrhaphy, posterior gastrojejunostomy, no loop, clamps 1 case traced, no symptoms 9 months after operation

Gastrogastrostomy, posterior gastrojejunostomy, short loop, suture 1 case traced, improved 2 years 3 months after operation.

Gastrogastrostomy, posterior gastrojejunostomy, no loop, clamps 1 case traced, improved 10 months after operation

Enteroenterostomy, ligation of pylorus 1 case traced, improved 2 years 3 months after operation

Partial gastrectomy, posterior gastrojejunostomy, no loop, clamps 1 case traced, no symptoms 8 months after operation

Pylorotomy, posterior gastrojejunostomy 1 case traced, no symptoms 4 years 8 months after operation

Pyloroplasty 1 case traced, no symptoms 4 years 7 months after operation

Pylorotomy, posterior gastrojejunostomy, long loop,

suture, primary enteroenterostomy 1 case traced, died 5 months after operation from general anasarca

Gastrorrhaphy, posterior gastrojejunostomy, long loop, suture, primary enteroenterostomy. 1 case traced, no symptoms 4 years 7 months after operation

An analysis of the various diseases of the stomach and duodenum for which operations were performed gives a good idea of the beneficial results obtained. The results presented at this time and those that will be brought before the medical world in five or ten years will vary considerably on account of the great advancement that is being constantly made in the technic of the various forms of operation advocated. The patients of the future will have the benefit of the work that has been accomplished in the past, all of which will be greatly to their advantage. It will also be established, probably, that a certain operative procedure is more fitted to the cure of one disease than to another, that each disease will be treated as an entity, with a special form of operation, whether it be a pyloroplasty, a posterior gastrojejunostomy, an excision, a pylorectomy, a partial gastrectomy, or what not.

The cases traced were diagnosed as follows: Ulcer of the stomach, 37 cases, of whom 23 were cured, 6 improved, 4 unimproved and 4 died, or 62.1 per cent cures. Ulcer of the duodenum, 12 cases, of which 2 had perforation. Of these 12 cases 11 were cured and 1 improved, or 91.6 per cent cures. Stenosis of pylorus, 8 cases, of which 5 were cured, or 63.5 per cent cures. Gastrectasis, 6 cases, of which 4 were cured, or 66.6 per cent of cures. Vicious circle and peripyloric adhesions, 1 case each, of which number neither was cured, although both were greatly improved. Neoplasm of the pylorus, 1 case, cured. Total, 66 cases traced of which number 44, or 66.6 per cent, were cured.

The list of diseases, the operation performed, and the end-results are as follows:

*Ulcer of stomach*, posterior gastrojejunostomy, long loop, suture. 4 cases traced, of whom 3 had no symptoms 4 years 4 months, 1 year 4 months (when he was killed in a

mine), and 1 year 9 months, respectively The fourth case died about 4 years after operation, cause of death not known

*Ulcer of stomach*, posterior gastrojejunostomy, primary enteroenterostomy, Murphy button 10 cases traced, of whom 6 had no stomach symptoms 4 years 4 months, 3 years 2 months (died nephritis), 2 years 11 months, 2 years (moved to Ireland), 2 years 4 months, respectively One case was improved 2 years 10 months after operation One case was unimproved, 2 years 8 months after operation Two cases died 2 months after operation, there having been no improvement in symptoms

*Ulcer of stomach*, posterior gastrojejunostomy, long loop, suture, secondary enteroenterostomy, Murphy button 1 case traced, no symptoms 4 years 6 months after operation

*Ulcer of stomach*, posterior gastrojejunostomy, no loop, suture 15 cases traced, of whom 8 had no symptoms 2 years 2 months, 2 years, 2 years, 1 year 9 months, 1 year 8 months, 1 year 5 months, 1 year 4 months, respectively, after operation Three cases were improved, 2 years, 1 year 5 months, 1 year 2 months, 3 were unimproved, 2 years 2 months, 1 year 6 months, 1 year 3 months, and one case died (cause of death unknown) 1 year, respectively, after operation

*Ulcer of stomach*, pylorotomy, posterior gastrojejunostomy, long loop, suture 1 case traced, no symptoms 4 years 8 months after operation

*Ulcer of stomach*, posterior gastrojejunostomy, long loop, suture, enteroenterostomy, Murphy button with secondary ligation of pylorus 1 case traced, no symptoms 2 years 2 months after operation

*Ulcer of stomach*, posterior gastrojejunostomy, secondary gastroduodenostomy with enteroenterostomy, Murphy button 1 case traced, greatly improved 1 year 6 months after operation

*Ulcer of stomach* with hour-glass contraction, 2 cases traced In both cases a gastrogastrostomy with posterior gastrojejunostomy, no loop, was performed Both cases were markedly improved, one 2 years 3 months, and the other 10 months after operation

*Ulcer of stomach*, perforated, gastrorrhaphy, posterior gastrojejunostomy, long loop, suture, primary enteroenterostomy, Murphy button 1 case traced, no symptoms 3 years 3 months after operation

*Ulcer of stomach*, posterior gastrojejunostomy, no loop, clamps 1 case traced, no symptoms 1 year after operation

*Ulcer of duodenum*, posterior gastrojejunostomy, long loop, suture 2 cases traced, both well 5 years 7 months, and 2 years 1 month, respectively, after operation

*Ulcer of duodenum*, posterior gastrojejunostomy, no loop, suture 5 cases traced, of which number 4 had no symptoms, 2 years 7 months, 1 year 11 months, 1 year 7 months, 1 year 1 month, respectively, after operation One case was improved 1 year 3 months after operation

*Ulcer of duodenum*, posterior gastrojejunostomy, no loop, clamps 3 cases traced, no symptoms 11 months, 10 months, and 6 months, respectively, after operation

*Ulcer of duodenum*, perforated, duodenorrhaphy, posterior gastrojejunostomy, long loop, suture, primary enteroenterostomy, Murphy button 1 case traced, well 3 years 7 months after operation

*Ulcer of duodenum*, perforated, duodenorrhaphy, posterior gastrojejunostomy, no loop, clamps 1 case traced, no symptoms 9 months after operation

*Stenosis of pylorus*, pyloroplasty 1 case traced, no symptoms 4 years 7 months after operation

*Stenosis of pylorus*, posterior gastrojejunostomy, long loop, suture, enteroenterostomy 2 cases traced, 1 having no symptoms 4 years 5 months, the other being unimproved 3 years after operation

*Stenosis of pylorus*, posterior gastrojejunostomy, no loop, suture 2 cases traced, both having no symptoms 2 years 4 months, and 1 year 7 months, respectively, after operation

*Stenosis of pylorus*, posterior gastrojejunostomy, long loop, suture, secondary entero-enterostomy, Murphy button 1 case traced, died 2 years 2 months after operation, cause of death unknown

*Stenosis of pylorus*, pylorotomy, posterior gastrojejunostomy, long loop, suture, primary enteroenterostomy, Murphy button 1 case traced, died 5 months after operation from nephritis, anasarca All stomach symptoms had disappeared.

*Stenosis of pylorus*, partial gastrectomy, posterior gastrojejunostomy, no loop, clamps 1 case traced, no symptoms 8 months after operation

*Gastrectasis with ptosis*, posterior gastrojejunostomy, long loop, suture 1 case traced, no symptoms 5 years 5 months after operation

*Gastrectasis*, posterior gastrojejunostomy, secondary enteroenterostomy, Murphy button 1 case traced, died 1 year after operation from intestinal obstruction due to bands

*Gastrectasis*, posterior gastrojejunostomy, no loop, suture 2 cases traced, no symptoms 1 year 7 months, and 1 year 2 months, after operation

*Gastrectasis*, posterior gastrojejunostomy, no loop, clamps 2 cases traced, 1 having no symptoms 11 months after operation, the other having died 7 months after operation, no improvement in symptoms

*Vicious circle*, enteroenterostomy, ligation of pylorus 1 case traced, improved 2 years 3 months after operation

*Peripyloric adhesions*, posterior gastrojejunostomy, no loop, suture 1 case traced, improved 1 year 7 months after operation

*Neoplasm of pylorus*, anterior gastrojejunostomy, suture 1 case traced, no symptoms 5 years 11 months after operation

From the foregoing analyses, I would draw the following conclusions, these naturally being influenced by the immediate dangers from the various forms of operation

1 The operation of choice should always be performed when feasible, when not feasible, the operation of necessity should be performed

2 All cases of stenosis of the pylorus, whether due to a neoplasm, cicatricial contraction, hyperplasia, pylorospasm, or what not, should be treated by operative interference, preferably by posterior gastrojejunostomy

TABULATED STATEMENT SHOWING END-RESULTS FOLLOWING OPERATIONS FOR BENIGN DISEASES  
OF THE STOMACH AND DUODENUM

Date	Case No	Diagnosis	Operation	End-Results
1902	478	Pyloric neoplasm, general adhesions	Ant gastrolejunostomy suture	Well, 5 yrs 11 mos
1902	1405	Uleer duod , stenosis pylorus	Post gastrolejunostomy, long loop, suture	Well, 5 yrs 7 mo
1902	1953	Uleer stom stenosis pylorus Adhesions	Post gastrolejunostomy, long loop, suture	Died, 4 yrs cause?
1902	2257	Gastrectasis	Post gastrolejunostomy, long loop, suture	Well, 5 yrs 5 mos
1903	1291	Stenosis pylorus Cholecystitis	Pyloroplasty Cholecystostomy	Well, 4 yrs 7 mos
1903	1385	Uleer stom , stenosis pylorus	Pylorotomy, post gastrolejunostomy, long loop, suture	Well, 4 yrs 8 mos
1903	1482	Stenosis pylorus	Post gastrolejunostomy, long loop, suture, secondary enteroenterostomy, Murphy button	Died, 2 yrs 2 mo ?
1903	1604	Uleer stom stenosis of pylorus	Post gastrolejunostomy, long loop, suture, secondary enteroenterostomy, Murphy button	Well, 4 yrs 6 mos
1903	1750	Stenosis of pylorus	Post gastrolejunostomy, long loop, suture, enteroenterostomy, Murphy button	Well, 4 yrs 5 mos
1903	2166	Uleer stomach cicatrized pylorus	Post gastrolejunostomy, long loop, suture, enteroenterostomy, Murphy button	Well, 4 yrs 4 mos
1903	2245	Uleer stom pyloric adhesions	Post gastrolejunostomy long loop, suture	Well, 4 yrs 4 mos
1904	881	Gastrectasis, gastroptosis	Post gastrolejunostomy, long loop, suture, secondary enteroenterostomy, Murphy button	Died, 1 yr Intest Obs
1904	1359	Uleer duodenum, perforated	Duodenorrhaphy, post gastrolejunostomy, long loop suture, and enteroenterostomy, Murphy button	Well 3 yrs 7 mos
1904	1705	Uleer stom , stenosis pylorus	Post gastrolejunostomy, long loop, suture, enteroenterostomy, Murphy button	Well, 3 yrs 4 mos

1901	2023	Ulcer stom, perforated	Gastrorrhaphy, post gastrojejunostomy, long loop, entero-enterostomy, Murphy button	Well, 3 yrs 3 mos
1904	3080	Ulcer stom, stenosis pylorus	Post gastrojejunostomy, long loop, suture, entero-enterostomy, Murphy button	Died, 2 mos exhaust
1901	1010	Ulcer of stomach	Post gastrojejunostomy, long loop, suture, entero-enterostomy, Murphy button	Died, 3 yrs 2 mos Nephritis
1905	137	Stenosis of pylorus due to mass	Post gastrojejunostomy, long loop, suture, entero-enterostomy, Murphy button	No imp 3 yrs
1905	293	Ulcer stom, cicatrix pylorus	Post gastrojejunostomy, long loop, suture, entero-enterostomy, Murphy button	Well, 2 yrs 11 mos
1905	560	Ulcer stom, stenosis pylorus	Post gastrojejunostomy, long loop, suture, entero-enterostomy, Murphy button	Died, 2 mos exhaust
1905	611	Ulcer stom, stenosis pylorus	Post gastrojejunostomy, long loop, suture, entero-enterostomy, Murphy button	Imp 2 yrs 11 mos
1905	717	Stenosis pylorus	Pylorotomy, post gastrojejunostomy, long loop, suture, entero-enterostomy, Murphy button	Died, 5 mos anasarca
1905	1051	Ulcer of stomach	Post gastrojejunostomy, long loop, suture, entero-enterostomy, Murphy button	No imp 2 yrs 8 mos
1905	1163	Ulcer stom, stenosis pylorus	Post gastrojejunostomy, long loop, suture, entero-enterostomy, Murphy button	Well, 2 yrs moved to Ireland
1905	1181	Ulcer duodenum induration	Post gastrojejunostomy, no loop, suture	Well, 2 yrs 7 mos
1905	1191	Ulcer stom, stenosis pylorus, adhesions to liver	Post gastrojejunostomy, long loop, suture, entero-enterostomy, Murphy button, secondary ligation of pylorus	Well, 2 yrs 2 mos
1905	1217	Stenosis of pylorus	Post gastrojejunostomy, no loop suture	Well, 2 yrs 4 mos
1905	1296	Ulcer stom stenosis pylorus	Post gastrojejunostomy, long loop, suture, entero-enterostomy, Murphy button	Well, 2 yrs 4 mos
1905	1336	Ulcer stomach	Post gastrojejunostomy, long loop, suture	Well, 1 yr 4 mos, killed in mine



TABULATED STATEMENT SHOWING END-RESULTS FOLLOWING OPERATIONS FOR BENIGN DISEASES  
OF THE STOMACH AND DUODENUM—*Continued*

Date	Case No.	Diagnosis	Operation	End Results
1905	2289	Ulcer stomach, stenosis pylorus	Post gastrojejunostomy, no loop, suture	Well, 2 yrs 2 mos
1905	2491	Ulcer stom, stenosis pylorus	Post gastrojejunostomy, no loop, suture	No imp 2 yrs 2 mos
1905	2595	Ulcer stom, hour glass contraction	Gastrogastrostomy, post gastrojejunostomy, no loop, suture	Imp 2 yrs 2 mos
1905	2610	"Vicious circle" pylorus occluded by old cicatrix	Enterocentrostomy, Murphy button	Imp 2 yrs 3 mos
1905	2621	Ulcer duod, stenosis pylorus	Post gastrojejunostomy, no loop, suture	Well, 2 yrs 1 mo
1905	2697	Ulcer of stomach	Post gastrojejunostomy, long loop, suture	Imp 1 yr 6 mos
			Secondary gastroduodenostomy, enterocentrostomy, Murphy button	
1905	2726	Ulcer stom, cicatrix pylorus	Post gastrojejunostomy, no loop, suture	Died, 1 yr Cause?
1906	178	Drosion of Duodenofo	Post gastrojejunostomy, no loop, suture	Well, 2 yrs
1906	201	Drosion of Duodenofo	Post gastrojejunostomy no loop, suture	Imp 2 yrs
1906	280	Ulcer of stom, stenosis of pylorus	Post gastrojejunostomy, no loop, suture	Well, 2 yrs
1906	437	Ulcer duodenum, stenosis pylorus	Post gastrojejunostomy, no loop, suture	Well, 1 yr 11 mos
1906	939	Ulcer of stom, cicatrix of pylorus	Post gastrojejunostomy, no loop, suture	Well, 1 yr 9 mos
1906	1231	Ulcer of stomach	Post gastrojejunostomy, long loop, suture	Well, 1 yr 9 mos
1906	1319	Ulcer stom, cicatrix duodenum, adhesions stomach and liver	Post gastrojejunostomy, no loop, suture	Well, 1 yr 8 mos
1906	1407	Gastrectasis	Post gastrojejunostomy, no loop, suture	Well, 1 yr 8 mos
1906	1408	Ulcer stom, stenosis pylorus	Post gastrojejunostomy, no loop, suture	Well, 1 yr 7 mos
1906	1413	Ulcer of duodenum	Post gastrojejunostomy, no loop, suture	Well, 1 yr 7 mos
1906	1427	Stenosis of pylorus	Post gastrojejunostomy, no loop, suture	Well, 1 yr 7 mos

1906	1462	Obstruction of pylorus by adhesions	Post gastrotomy, no loop, suture	Imp 1 yr 7 mos
1906	1609	Ulcer stom, with gastrectasis	Post gastrotomy, no loop, suture	No imp 1 yr 6 mos
1906	1942	Erosion of Duodenum	Post gastrotomy, no loop, suture	Imp 1 yr 5 mos
1906	2035	Ulcer stom, gastrectasis with ptosis	Post gastrotomy, no loop, suture	Well, 1 yr 5 mos
1906	2226	Ulcer of stomach	Post gastrotomy, no loop, suture	Well, 1 yr 4 mos
1906	2288	Ulcer of duodenum	Post gastrotomy, no loop, suture	Imp 1 yr 3 mos
1906	2545	Gastrectasis	Post gastrotomy, no loop, suture	Well, 1 yr 2 mos
1906	2611	Erosion of Duodenum	Post gastrotomy, no loop, suture	No imp 1 yr 2 mos
1906	2726	Ulcer stom, with stenosis pylorus	Post gastrotomy, no loop, suture	Imp 1 yr 2 mos
1906	2976	Ulcer duodenum adhesions	Post gastrotomy, no loop, suture	Well, 1 yr 1 mo
1907	180	Ulcer stomach	Post gastrotomy, no loop, clamps	Well, 1 yr
1907	329	Ulcer of duodenum, cicatricial contraction	Post gastrotomy, no loop, clamps	Well, 11 mos
1907	570	Gastrectasis	Post gastrotomy, no loop, clamps	Well, 11 mos
1907	805	Ulcer stomach, hour-glass contraction	Gastrotomy, post gastrotomy, no loop, clamps	Well, 10 mos
1907	921	Ulcer of duodenum	Post gastrotomy, no loop, clamps	Well, 10 mos
1907	1060	Ulcer of duodenum, perforated	Duodenorrhaphy, post gastrotomy, no loop, clamps	Well, 9 mos
1907	1236	Stenosis pylorus, adhesions to liver	Partial gastrectomy, post gastrotomy, no loop, clamps	Well, 8 mos
1907	1606	Gastrectasis	Post gastrotomy, no loop, clamps	Died, 7 mos
1907	1737	Ulcer of duodenum	Post gastrotomy, no loop, clamps	Well, 6 mos

3 All cases of ulcer of the stomach which do not respond to medical treatment promptly, and the various sequelæ of this disease, should be treated by operation

4 All cases of ulcer of the duodenum, which do not respond promptly to medical treatment, should be treated by operation

5 My preference in performing gastroenterostomy is by the posterior gastrojejunostomy, no loop, clamp route

A list of the cases traced, in more or less detail, follows

#### ABSTRACTS OF CASE HISTORIES

I Patient 478, 1902 —Transferred from medical to surgical wards with history of long-standing stomach trouble due to pyloric obstruction Oper 3-10-'02 —Ether anæsthesia Stomach slightly enlarged Mass size of lemon occupying seat of pylorus Adhesions of long standing prevented posterior gastrojejunostomy Anterior gastrojejunostomy performed, with sutures Recovery February 5, 1908—No symptoms Is in very good health Gained 36 pounds

II Patient 1405, 1902 —Female aged 38 For 15 years had had indigestion, pains in epigastric region, nausea No mass palpable Oper 7-27-'02 —Ulcer of duodenum with cicatricial stenosis of pylorus Posterior gastrojejunostomy, long loop, suture February 9, 1908—No symptoms except constipation In good health Has gained in weight

III Patient 1953, 1902 —Female aged 27 For six months had pain after eating, with vomiting half hour after meals Pains marked in epigastrium Eructations of gas No blood in vomitus Oper 10-11-'02 —Ether anæsthesia Ulcer of stomach, with adhesions between stomach and liver, pylorus thickened and indurated Posterior gastrojejunostomy, long loop, suture Patient died four years after operation, cause of death unknown.

IV Patient 2257, 1902 —Male aged 29 Very irregular in regard to meals For six years has had epigastric pains, generally worse at night, oftentimes when asleep Would awaken to find stomach greatly distended and painful Eructations of gas gave relief For last six weeks has had vomiting attacks, vomitus consisting of partly digested food No blood Lost 20 pounds in six weeks Oper 11-19-'02 —Lesser curvature of stomach

on level with umbilicus, greater curvature 5 inches below Posterior gastrojejunostomy, long loop, suture February 4, 1908—No symptoms. In good health Has gained 66 pounds

V Patient 1291, 1903—Male, aged 45 For 8 years had suffered from stomach trouble with marked constipation Tenderness last year over gall-bladder region Oper 6-11-'03—Chronic cholecystitis Pylorus thickened and contracted No scars discernible Cholecystostomy Pyloroplasty January 27, 1908—Slight soreness over gall-bladder No stomach symptoms Health good Has gained in weight

VI Patient 1385, 1903—Female, aged 48 Subject to stomach and liver troubles for last 10 years Attacks would recur at intervals of about 10 months, lasting 2 to 3 weeks Ten months ago had severe attack with coffee-ground vomitus, which was very acid Abdomen distended, some tenderness in epigastric region Oper 6-24-'03—Ulcer of stomach with stenosis of pylorus Pylorectomy, posterior gastrojejunostomy, long loop, suture Pathological diagnosis—Hyperplasia of submucous and muscular coats, extensive round-celled infiltration February 3, 1908—No symptoms In fine health Has gained normal weight

VII Patient 1482, 1903—Female, aged 24 For three years had fulness and distress after eating. For two years became nauseated after eating, with vomiting No blood in vomitus nor stools Steady dull pain, burning in character just above umbilicus Not relieved by eating Oper 7-23-'03—Numerous adhesions around neck of gall-bladder and duodenum Stomach slightly enlarged, in rather low position, pyloric opening thickened and lumen narrowed Posterior gastrojejunostomy, long loop, suture Persistent vomiting after operation Second Oper 7-18-'03—Anastomosis in good condition Enteroenterostomy, Murphy button Patient died in September, 1905, cause of death not known

VIII Patient 1604, 1903—Male, aged 32 For 12 years had stomach trouble About once yearly would have attacks of pain in epigastrium, with soreness and vomiting Pain relieved by taking food Attacks lasted 3 to 4 weeks Ten days had severe attack, pains in epigastrium and over gall-bladder, referred to shoulders Vomiting, but no blood in vomitus at any time Oper 7-23-'03—Stomach increased in size, greater curvature

about 2 inches below umbilicus Adhesions of pyloric end of stomach to gall-bladder Cicatrix of ulcer Posterior gastrojejunostomy, long loop, suture Persistent vomiting after operation Second Oper 8-3-'03—Anastomosis in good condition Enteroenterostomy, Murphy button January 28, 1908—No symptoms In good health Gained 34 pounds

IX Patient 1750, 1903—Male, aged 41 Had enteric fever 18 years ago, followed by "stomach trouble," which has persisted Last two years could not eat much solid food Last three months has lost 20 pounds Oper 8-15-'03—Stenosis of pylorus Posterior gastrojejunostomy, long loop, suture, enteroenterostomy, Murphy button January 27, 1908—No symptoms In good health Has gained 44 pounds

X Patient 2166, 1903—Female, aged 47 "Indigestion" last 20 years Pneumonia 10 years ago, enteric fever 9 years ago Two years ago had sudden attack of dull pain in epigastrium which increased in severity and extended over entire abdomen Pains relieved by vomiting, the vomitus being at times blood streaked Stools very dark during attacks of pain Oper 10-14-'03—Ulcer of stomach with cicatricial mass near pylorus Posterior gastrojejunostomy, long loop, suture, enteroenterostomy, Murphy button February 11, 1908—No stomach symptoms In good health, except is rheumatic

XI Patient 2245, 1903—Had "indigestion" at irregular intervals for 15 years Fifteen months ago had sharp epigastric pains which radiated to back Has had but one attack of hematemesis Nausea and vomiting of undigested food about half hour after meals Oper 10-24-'03—Stomach dilated, extending below umbilicus, cicatrix from ulcer, with adhesions, near pylorus Posterior gastrojejunostomy, long loop, suture February 3, 1908—No symptoms "Not better in years" Has gained 35 pounds

XII Patient 881, 1904—Female, aged 46 Erysipelas of face recurring from age of 8 once or twice yearly for years Had three large pulmonary hemorrhages at short intervals, 20 years ago Had "indigestion" last 13 years Eructations, hiccoughs, gastric distress with pain after eating No vomiting Has been on milk diet for weeks at a time Oper 5-14-'04—General lengthening of the mesentery of the bowel, with ptosis of stomach and intestine Stomach was very much dilated Posterior gas-

trojejunostomy, long loop, suture Persistent vomiting after operation Second operation 5-31-'04—Anastomosis in good condition Enteroenterostomy, Murphy button Re-admitted to German Hospital 5-21-'05 in a very weak condition, abdomen markedly distended, constant vomiting Condition had lasted three days Oper 5-21-'05—Omentum adherent to parietal peritoneum Obstruction of bowel by bands, with volvulus of mesentery Obstruction relieved Patient died on the table

XIII Patient 1359, 1904—Male, aged 32 For 9 years had been a sufferer from epigastric pains, nausea and constipation Could not vomit Day before admission had excruciating pains, worse in right hypochondrium Oper 7-3-'04—Perforated ulcer of duodenum Ulcer 3 mm in diameter Ulcer closed with silk Lembert suture Posterior gastrojejunostomy, long loop, suture, enteroenterostomy, Murphy button February 1, 1908—No symptoms In fine condition

XIV Patient 1705, 1904—Male, aged 48 Had first attack of "stomach trouble" 19 years ago, lasting 2 weeks Loss of appetite, vomiting, constipation, pains in epigastrium Six years later had similar attack lasting several weeks In last four or five years attacks have become more frequent Pain usually relieved by phosphate of soda Has been under treatment for years Oper 9-9-'04—Ulcer of stomach with cicatricial contraction near pylorus Posterior gastrojejunostomy, long loop, suture, enteroenterostomy, Murphy button January 26, 1908—No symptoms In fine health

XV Patient 2023, 1904—Had had "indigestion" for years Admitted to hospital with history of sudden attack of pain in epigastrium, followed by sweating, collapse Abdomen distended and tender Oper 10-24-'04—Ulcer of stomach, perforated Ulcer closed with silk Lembert suture Posterior gastrojejunostomy, long loop, suture, enteroenterostomy, Murphy button January 30, 1908—Has no symptoms, no suffering, but complains of lack of strength

XVI Patient 2080, 1904—Male, aged 30 Was operated upon about 2 months before admission, for mastoid disease (at another hospital) Five weeks before admission had sharp pain after eating solids, pains lasting about 10 minutes Gradually increased in severity so that he could take nothing but liquids Continuous nausea after eating, but no vomiting Oper 11-17-

'04—Stomach walls thicker than normal near pylorus, and pyloric opening constricted Posterior gastrojejunostomy, long loop, suture, enteroenterostomy Patient died about 1-1-'05 there having been no improvement in his symptoms Died from inanition and exhaustion

XVII Patient 4010, 1904—Male, aged 24 Had had "indigestion" for years Eructations of gas, marked pain after eating, nausea and vomiting At times blood in vomitus Oper 11-23-'04—Ulcer of stomach Posterior gastrojejunostomy, long loop, suture, enteroenterostomy, Murphy button Patient died in January, 1908, from nephritis Had had no stomach symptoms after operation

XVIII Patient 137, 1905—Male, aged 37 For 7 years had gastric distress, worse after eating, constipation, loss of weight Vomiting at long intervals Mass palpable to left of umbilicus Oper 1-21-'05—Pylorus thickened, lumen contracted No other lesion found in stomach or intestine Posterior gastrojejunostomy, long loop, suture, enteroenterostomy, Murphy button January 31, 1908—At times has same symptoms as before operation Under medical treatment Health poor No natural bowel movements

XIX Patient 293, 1905—Male, aged 31 For 8 years had gastric cramps No vomiting until 4 years ago Constant dull, aching pain in epigastrium, worse at night Vomiting Oper 2-9-'05—Ulcer of stomach with cicatrix near pylorus Posterior gastrojejunostomy, long loop, suture, enteroenterostomy, Murphy button January 24, 1908—No symptoms In good health Gained in weight

XX Patient 560, 1905—Male, aged 24 For years had had "stomach trouble" Last 8 months had cramp-like pains in stomach, worse at night, aggravated by eating Constant pain during last month Oper 3-23-'05—Ulcer of stomach with cicatricial stenosis of pylorus Posterior gastrojejunostomy, long loop, suture, enteroenterostomy, Murphy button Patient died about two months after operation Had had persistently blood stools Death probably due to exhaustion and inanition

XXI Patient 618, 1905—Male, aged 38 Indefinite history of "stomach trouble" extending over years During last year had marked pains in stomach, worse at night Solid food vomited 24 hours after ingestion Oper 3-23-'05—Ulcer of stomach

near pylorus, with stenosis of pylorus Posterior gastrojejunostomy, long loop, suture, enteroenterostomy, Murphy button January 24, 1908—Much better than before operation Health fair. Has gained in weight

XXII Patient 747, 1905—Female, aged 65 For 7 years had pains in epigastrium after eating, vomiting two or three hours after meals No hematemesis Oper 4-7-'05—Stenosis of pylorus Pylorectomy, posterior gastrojejunostomy, long loop, suture; enteroenterostomy, Murphy button Pathological Report—Fibrous thickening of submucous and muscular coats Patient died about 5 months after operation, having developed general anasarca, urine very scanty Marked ascites

XXIII Patient 1054, 1905—Female, aged 29 For 8 years had suffered from chlorosis Had anorexia, vomiting, hematemesis, pain in stomach after eating Oper 5-20-'05—Ulcer of stomach Posterior gastrojejunostomy, long loop, suture, enteroenterostomy, Murphy button January 28, 1908—Attacks similar to those before operation persisted Went to Scotland and entered Victoria Infirmary, Glasgow. Exploratory operation performed, everything found all right Abdomen closed Never free from suffering Health same as before operation

XXIV Patient 1163, 1905—Female, aged 24 For 4 years had gastric pains with vomiting 2 hours after meals Pain, burning in character Oper 6-10-'05—Ulcer of stomach with cicatrix near pylorus Posterior gastrojejunostomy, long loop, suture, enteroenterostomy, Murphy button Patient moved to Ireland in June, 1907, in fine health

XXV Patient 1381, 1905—Male, aged 35 For 5 weeks had dull epigastric pains, about 2 hours after meals No vomiting Constipated Lost 30 pounds Oper 6-29-'05—Ulcer of duodenum, with induration Posterior gastrojejunostomy, short loop, suture January 24, 1908—No symptoms In splendid health Gained 20 pounds

XXVI Patient 1494, 1905—Male, aged 31 For 2 years had abdominal pains, vomiting after eating with relief Malena Oper 7-14-'05—Ulcer of stomach, stenosis of pylorus with adhesions to liver Posterior gastrojejunostomy, long loop, suture, enteroenterostomy, Murphy button Pains continued after operation, persistent vomiting Second Oper 11-2-'05—Anastomoses in good condition Adhesions between pylorus and ab-



dominal wall Pylorus ligated with silk February 11, 1908 —  
No symptoms In splendid health Gained in weight

XXVII Patient 1927, 1905 —Female, aged 28 Nine years ago had operation for appendicitis with secondary abscesses Last two years has had "stomach trouble," great pain in epigastrium with vomiting Oper 9-17-'05 —Circular thickening of pylorus No scars Posterior gastrojejunostomy, no loop, suture January 30, 1908 —No symptoms Free from all suffering one year after operation Has gained in weight

XXVIII Patient 1986, 1905 —Female, aged 30 For 10 years has had dull, boring pains in epigastrium, vomiting Hematemesis Oper 9-14-'05 —Ulcer of stomach with stenosis of pylorus Posterior gastrojejunostomy, long loop, suture, enteroenterostomy, Murphy button January 29, 1908 —No symptoms Health very good

XXIX Patient 2196, 1905 —Male, aged 23 Oper 10-12-'05 —Ulcer of stomach Posterior gastrojejunostomy, long loop, suture Patient was in good health, with no stomach symptoms November 11, 1906, when he was hurt while following his occupation of miner, from which injuries he died three days later

XXX Patient 2467, 1905 —Male, aged 53 Had "stomach trouble" for 30 years Had ulcer of stomach, for which a pyloroplasty had been performed in another hospital 5 years ago Was well until 1 year ago, when he had epigastric pains, with vomiting after meals, pains worse at night Oper 11-11-'05 —Pylorus markedly indurated Posterior gastrojejunostomy, no loop, suture January 23, 1908 —No symptoms Health "could not be better" Gained 20 pounds

XXXI Patient 2491, 1905 —Male, aged 20 For 2 years had had epigastric pains, dull and heavy, after eating Eructations of gas, nausea but no vomiting Constipated Oper 11-18-'05 —Ulcer of stomach with stenosis of pylorus Posterior gastrojejunostomy, no loop, suture January 29, 1908 —About same as before operation Has distress and pain after eating "Sour stomach," and constipation

XXXII Patient 2595, 1905 —Female, aged 24 For 3 years had epigastric pains after eating Nausea but no vomiting Oper 11-28-'05 —Ulcer of stomach with hour-glass contraction Stomach incised longitudinally and sutured transversely Posterior gastrojejunostomy, no loop, suture February 18, 1908 —

Symptoms improved During pregnancy had no symptoms, and was perfectly well Since child-birth, symptoms have returned but is better than before operation

XXXIII Patient 2610, 1905 —Had been operated upon in 1900, at another hospital, for ulcer, posterior gastrojejunostomy, Murphy button, having been performed For 1 year was in good health, gained 35 pounds Symptoms returned, vomiting, with pain in epigastrium Oper 11-29-'05 —Gastrojejunostomy opening patulous but small Pylorus occluded by old scar, partially. Enteroenterostomy, Murphy button Ligation of pylorus, silk February 11, 1908 —Better than before operation, but has attacks of vomiting, the vomitus being bitter and very sour Has gained in weight

XXXIV. Patient 2621, 1905 —Male, aged 44 As far back as patient can remember he has had dull pain localized at point midway between ensiform and umbilicus Pain relieved by eating, returns about 2 hours after meals No hematemesis Has noticed blood streaks in stools Lavage of stomach during past year Slight relief Oper 12-2-'05 —Ulcer of duodenum with thickening and constriction of pylorus Posterior gastrojejunostomy, no loop, suture January 23, 1908 —No symptoms In very good health

XXXV Patient 2683, 1905 —Female, aged 29 Oper 12-11-'05 —Ulcer of stomach Posterior gastrojejunostomy, long loop, suture Readmitted to hospital 4-6-'06, vomiting more or less constant since last operation Second Operation 5-19-'06 —Anastomosis in good condition Pylorus occluded Gastroduodenostomy, suture, enteroenterostomy, Murphy button January 27, 1908 —Some improvement Health not good Sick from time to time

XXXVI Patient 2726, 1905 —Male, aged 28 For 6 years had "indigestion," epigastric pains, irregular vomiting Loss of weight and strength Oper 12-16-'05 —Ulcer of stomach with cicatrix near pylorus Posterior gastrojejunostomy, no loop, suture Patient died 12-14-'06, cause of death not known

XXXVII Patient 178, 1906 —Male, aged 41 No serious illness in adult life except pain over gall-bladder. Had exploratory cholecystotomy performed (in a southern city), no calculi found Wound closed without drainage of gall-bladder Had continued pain along right costal margin, dull and steady, at

times referred to back Never vomits, but is nauseated Oper 1-11-'06—Stomach enlarged, marked adhesions between pylorus and liver On incision into stomach, mucous membrane found hemorrhagic Posterior gastrojejunostomy, no loop, suture January 10, 1908—No symptoms "Never in better health in my life"

XXXVIII Patient 204, 1906—Male, aged 34 Two months before admission had violent attack of diarrhoea, lasting 4 days, followed by constipation which has persisted Vomits at irregular intervals Oper 1-31-'06—Mucous membrane of stomach very hemorrhagic Slight adhesions between pylorus and liver Posterior gastrojejunostomy, no loop, suture January 8, 1908—Better than before operation, but not well Gained in weight

XXXIX Patient 280, 1906—Female, aged 57 Not well during last 8 months About 4 weeks before admission had sudden attack of pain in epigastrium with vomiting Has been unable to eat solid food since that time Vomiting begins about 1 hour after meals Oper 2-3-'06—Stomach dilated, ptosed, veins distended over greater part of surface Pylorus opaque, thickened and nodular Mucous membrane of stomach markedly hemorrhagic Posterior gastrojejunostomy, no loop, suture February 8, 1908—Patient in good health No symptoms

XL Patient 437, 1906—Male, aged 41 For 24 years had had "indigestion," accompanied irregularly with epigastric pains and vomiting Oper 2-21-'06—Ulcer of duodenum with cicatrix Posterior gastrojejunostomy, no loop, suture January 15, 1908—No symptoms since operation Health very good Gained 30 pounds

XLI Patient 939, 1906—Female, aged 18 For 4 years had discomfort in epigastrium, distress after eating, with vomiting No hematemesis Tenderness over stomach Oper 4-21-'06—Ulcer of stomach with cicatrix near pylorus Posterior gastrojejunostomy, no loop, suture January 20, 1908—No symptoms "General health very good" Gained in weight

XLII Patient 1234, 1906—Male, aged 48 Enteric fever at 15, malaria at 38 For past 3 years had "stomach trouble," fulness of stomach with eructations Pains in epigastrium with vomiting Lost 27 pounds Oper 5-23-'06—Ulcer of stomach Posterior gastrojejunostomy, long loop, suture February 21,

1908—No symptoms In very good health Has gained 15 pounds

XLIII Patient 1309, 1906—Male, aged 36 For 2 years had epigastric pains, made worse by eating Nausea and vomiting No hematemesis Oper 6-2-'06—Ulcer of stomach, cicatricial contraction of pylorus, adhesions between stomach and liver Posterior gastrojejunostomy, no loop, suture February 21, 1908—No symptoms In good health Gain in weight

XLIV Patient 1408, 1906—Male, aged 40 For 3 years abdominal and epigastric pains, cramp-like, not affected by eating Pain followed by vomiting Oper 6-13-'06—Ulcer of stomach with induration near pylorus Posterior gastrojejunostomy, no loop, suture February 22, 1908—No symptoms Gain in weight

XLV Patient 1407, 1906—Female, aged 38 For 2 months had headaches, epigastric pains, nausea, vomiting. Distress in epigastrium immediately after eating Vomitus at times blood tinged Some pain in stomach most of the time Oper 6-18-'06—Stomach very much dilated, vessels engorged, serosa congested, slight if any stenosis of pylorus Posterior gastrojejunostomy, short loop, suture January 9, 1908—No symptoms Health good Normal weight

XLVI Patient 1413, 1906—Female, aged 18 For 1 year had epigastric pains, lately becoming very sharp and severe, with vomiting No hematemesis Oper 6-14-'06—Ulcer of duodenum Posterior gastrojejunostomy, no loop, suture January 24, 1908—Symptoms for which operation was performed have all disappeared, although patient is not very strong

XLVII Patient 1427, 1906—Male, aged 46 Has been sick for years Uncontrollable vomiting, no blood in vomitus Veins of abdomen very prominent Oper 6-13-'06—Stomach walls thickened, congested Pylorus thickened, lumen narrowed Posterior gastrojejunostomy, no loop, suture January 15, 1908—No symptoms Health "unusually good" Gained in weight

XLVIII Patient 1462, 1906—Female, aged 40 Operated upon 10 years ago in southern city for cholelithiasis, calculi removed, gall-bladder drained Six years later had biliary fistula for 3 days One year later had attack of biliary colic Bulging of scar, lanced by physician, fecal matter and pus released

Sinus discharging at time of admission to German Hospital Oper 6-23-'06—Adhesions between cicatrix and omentum, bowel, gall-bladder and pylorus Adhesions so dense around pylorus that function was impaired Stomach slightly dilated Posterior gastrojejunostomy, no loop, suture January 26, 1908—is better than before stomach operation, but is not well Has had pains similar to former attacks Vomits bile at irregular intervals

XLIX Patient 1609, 1906—Female, aged 18 Exploratory coliotomy performed in 1904 Stomach found slightly dilated, pylorus patulous No pathological lesions found In February, 1905, was treated in medical wards for "stomach trouble" Had dull, heavy pains, suffocating in character, in epigastrium, worse after eating, with nausea and feeling of extreme weakness Had to induce vomiting, after which pains were relieved Notice bright red blood in vomitus lately Operation—Stomach slightly dilated, walls congested, veins engorged Small patch of fibrous tissue (cicatricial?) at pylorus Omentum adherent Incision into stomach revealed clot of blood Posterior gastrojejunostomy, no loop, suture January 7, 1908—No relief "Life a burden" Always miserable Lost 20 pounds

L Patient 1942, 1906—Female, aged 49 Had "inflammation of bowels" 20 years ago Six months ago after heavy cold, noticed distress after eating Anorexia No vomiting but nausea No sharp pains Dull pain in epigastrium between meals Losing weight rapidly Marked tenderness and some rigidity in epigastrium Oper 8-29-'06—Walls of stomach thickened, veins prominent, and enlarged No pyloric obstruction, no scars Gall-bladder and duodenum apparently normal Incision into stomach showed mucous membrane highly congested A quantity of fresh blood found in stomach Posterior gastrojejunostomy, no loop, suture January 9, 1908—Much better than before operation Stomach troublesome at times Health fair Same weight

LI Patient 2035, 1906—Female, aged 36 Since childhood has had "stomach trouble," with irregular attacks of nausea, and vomiting associated with severe headaches For last year had pains immediately after eating, with full, bloated feeling Vomiting has been more or less constant, beginning immediately after meals At times is blood tinged Has vomited

bright red blood Pain relieved by vomiting Oper 8-27-'06—Ulcer of stomach, with gastrectasis and gastroptosis Posterior gastrojejunostomy, no loop, suture January 11, 1908—No symptoms Health very good Gained 50 pounds

LII Patient 2226, 1906—Female, aged 26 For 2 years has had continued "stomach trouble," marked pains in epigastrium, with vomiting Has lost 30 pounds Oper 9-26-'06—Ulcer of stomach Posterior gastrojejunostomy, no loop, suture January 15, 1908—No symptoms In good health

LIII Patient 2288, 1906—Female, aged 27 For 4 months has had constant distress in stomach, worse about 2 hours after eating No nausea or vomiting No comfort after eating Lost 20 pounds in 4 months Oper 10-3-'06—Ulcer of duodenum Posterior gastrojejunostomy, no loop, suture January 14, 1908—Still has "stomach trouble" Health not very good, but better than before operation

LIV Patient 2545, 1906—Female, aged 18 For 2 years had noticed a "swelling" of the stomach which caused no inconvenience until 8 months ago Then had throbbing in left hypochondrium just below costal margin Pain constant, never referred to back or shoulders Number of dark blood clots found in stools during last year Patient thinks "swelling" has been more marked on right side than left, although pain has been worse on left side Oper 11-1-'06—Stomach bulged out of wound Enormously distended, walls thin No apparent cause of distention Posterior gastrojejunostomy, no loop, suture February 10, 1908—No symptoms In good health

LV Patient 2611, 1906—Female, aged 32 Had enteric fever 11 years ago Had attack similar to present one 3 months ago, lasting 3 to 4 weeks Sharp cutting pain in epigastrium extending downward into abdomen Nauseated, but could not vomit Pain constant last eight weeks Pain relieved by eating Oper 11-10-'08—No external evidence of disease in stomach Stomach incised, mucosa greatly injected, bled easily when touched Several small areas markedly hemorrhagic One such spot ligated Posterior gastrojejunostomy, no loop, suture January 28, 1908—Symptoms same as before operation No improvement in general condition

LVI Patient 2726, 1906—For 3 years has had "stomach trouble" Pains in epigastrium, sharp and cutting in character,

not relieved by food Generally made worse Never vomits, but is nauseated Oper 11-21-'06—Ulcer of stomach with cicatrix near pylorus Posterior gastrojejunostomy, no loop, suture January 16, 1908—For 6 weeks after operation had no symptoms Since then has had "stomach trouble," but is much better than before operation

LVII Patient 2976, 1906—Male, aged 39 For 3 months had sharp, stabbing epigastric pains, beginning 2 or 3 hours after eating Relieved by eating Vomiting marked, especially at night Lost 40 pounds Oper 12-24-'06—Ulcer of duodenum with periduodenal adhesions Posterior gastrojejunostomy, no loop, suture January 7, 1908—No symptoms "Never so well in my life" Gained 45 pounds

LVIII Patient 180, 1907—Female, aged 32 'Always had "stomach trouble" Burning epigastric pains, worse after eating, relieved by vomiting No vomiting last 3 months, but pain is severe Oper 1-21-'07—Ulcer of stomach Posterior gastrojejunostomy, no loop, clamps January 6, 1908—No symptoms In good health "A new woman" Gained 20 pounds

LIX Patient 329, 1907—Female, aged 47 For 6 months had sharp epigastric pains followed by vomiting, especially in evening Pains relieved by food, temporarily, getting worse about 2 hours after meals Oper 2-4-'07—Ulcer of duodenum with contraction Posterior gastrojejunostomy, no loop, clamps January 23, 1908—No symptoms Health steadily improving Gained 33 pounds

LX Patient 570, 1907—Female, aged 14 Oper 2-28-'07—Stomach greatly distended Posterior gastrojejunostomy, no loop, clamps January 23, 1908—Stomach greatly improved Nerves upset Gained 25 pounds

LXI Patient 805, 1907—Female, aged 38 Ten years ago began to have epigastric pains, relieved by vomiting Pain cutting and severe Vomiting relieved pain Attacks at irregular intervals during last 10 years Oper 3-27-'07—Ulcer of stomach with hour-glass contraction Gastrogastrostomy, clamps, suture Posterior gastrojejunostomy, no loop, clamps January 7, 1908—No symptoms Very fine health About same weight

LXII Patient 921, 1907—Male, aged 56 Oper 4-8-'07—Ulcer of duodenum, beyond pylorus Posterior gastrojejunos-

tomy, no loop, clamps February 1, 1908—No symptoms In very good health Gained 30 pounds

LXIII Patient 1060, 1907—Male, aged 51. History of duodenal ulcer of 10 years' standing Perforated day of operation Oper 4-21-'07—Ulcer of duodenum, perforated Duodenum infiltrated and thickened Ulcer closed with silk Lembert suture Posterior gastrojejunostomy, no loop, clamps January 4, 1908—No symptoms Fine health Twelve pounds heavier than average weight before operation

LXIV Patient 1236, 1907—Male, aged 57 For 8 months has had attacks of nausea with vomiting, vomitus containing blood Very little pain Lost 30 pounds Oper 5-9-'07—Pylorus thickened and indurated, lumen contracted, adhesions to adjacent viscera Partial gastrectomy, posterior gastrojejunostomy, no loop, clamps Pathological Diagnosis—Chronic hyperplasia of pylorus January 6, 1908—No symptoms Health steadily improving Gained 10 pounds

LXV Patient 1606, 1907—Male, aged 56 Fifteen years ago had gastritis, lasting 6 months Vomited 15 minutes after meals No nausea or pain Few similar attacks until 6 months ago when there was great discomfort, vomiting of undigested food, but no blood Oper 6-24-'07—Gastrectasis Posterior gastrojejunostomy, no loop, clamps January 16, 1908—"Died this morning" No improvement since operation

LXVI Patient 1737, 1907—Male, aged 56 For 8 months had annoying but not severe pains in epigastrium No vomiting, no nausea Pains at times dull and aching, relieved by food Tenderness over epigastrium Oper 7-8-'07—Ulcer of duodenum, with cicatrix Posterior gastrojejunostomy, no loop, clamps January 3, 1908—No symptoms Health steadily improving Gained 10 pounds



## HOW FREQUENTLY DO GASTRIC ULCERS BECOME CARCINOMATA? \*

BY WILLIAM L RODMAN, M D,

OF PHILADELPHIA, PA,

Professor of Surgery in the Médico-Chirurgical College

ALTHOUGH recognizing some of the dangers of gastric ulcer, such as hemorrhage and perforation, internists generally seem oblivious to other serious complications and sequelæ, particularly carcinoma, which I believe to be due in at least 50 per cent of all cases, to a previous ulcer

The idea that gastric ulcer may degenerate into carcinoma is not new, it having been enunciated in 1839 by Cruveilhier. Various references to the subject may be found in literature from that time to the present. Statistics concerning the frequency of the occurrence vary, but the latest studies give the highest percentage. Thus of 156 cases of gastric cancer examined post-mortem in the pathological institute at Kiel from 1872 to 1891, Sonnichsen found that 14 per cent undoubtedly developed from ulcers, whereas Klaus, after studying 120 cases examined in the same institute from 1891 to 1900, found that 26 per cent originated in ulcer. Stich states that ulcer carcinoma constitutes 30 per cent of gastric cancers. W J Mayo found that in 54 per cent of the cases of gastric cancer submitted to resection in 1905-6 at the Rochester Clinic, both the clinical history and pathological examination of removed specimens made it certain the cancers had their origin in ulcers. Moynihan states that in his last 22 cases of gastric cancer a history of ulcer was present in 16 or 72.1 per cent.

Robson, in his Bradshaw Lecture, reports no less than 59.3 per cent of his cases of cancer of the stomach giving a previous history of chronic ulcer.

Ssapesenko found that of 100 gastric carcinomas only ten cases did not originate on the base of a peptic ulcer. The same author reports cases which had developed pyloric carcinoma five

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\* Abstract of paper read before the American Surgical Association, May 5, 1908

or six years after a gastro-enterostomy had been done for ulcer. Within two years I have had nine patients with cancer who gave an unmistakable history of ulcer.

Diagnosis is difficult. Cases have occurred in persons from 16 to 75 years old. The majority are in those past forty. In some cases the classical symptoms of chronic ulcer are so marked that there is no suspicion of carcinoma, and it is only when the abdomen is opened that the nature of the lesion is revealed. Even then mistakes have been made by those most experienced in gastric diseases. In other cases, after two or more years, the symptoms change so that malignant degeneration is suspected. Anorexia becomes pronounced, pain more constant, hæmatemesis more frequent, the vomited blood darker. Tuffier has described another form in which the symptoms of ulcer are absent, or present only in slight degree, but in which the signs of cancer soon develop rapidly.

Little is to be learned from gastric analysis as the chemical characteristics may be the same as in simple ulcer. Rapid and regular diminution or disappearance of hyperacidity at intervals is the most important sign. This phenomenon probably indicates that cancer is developing. The difficulty of diagnosis is the strongest plea that can be made for early exploratory operation in all gastric cases of doubtful nature failing to yield to medical treatment within a reasonable time. I advocate the removal of all suspicious lesions, by simple excision, pylorotomy, or partial gastrectomy, according to the conditions of the individual case.

# GASTRIC AND DUODENAL ULCERS SECONDARY TO WOUNDS OF THE URINARY BLADDER\*

BY JOHN B ROBERTS, M D,

OF PHILADELPHIA, PA,

Professor of Surgery in the Philadelphia Polyclinic

AN instance of hæmatemesis and perforated gastric ulcer causing death after a successful suprapubic lithotomy happened in my work in 1886 and was reported by me in 1887 † A young surgeon, earnestly advocating the then generally disfavored high operation for stone in the urinary bladder, was naturally a good deal chagrined at the death of a patient from so unexpected a complication I at first considered the vomiting of blood, which happened on the eighth day, and the perforation of the stomach wall, which took place nearly two months later, as the results of a prior latent gastric lesion I concluded at a later date that the fatal ulceration of the stomach might be fairly attributed to the same etiology as the duodenal ulceration, familiar to surgeons in those days, after burns of the surface of the human body

Two years ago sudden death came to one of my patients by reason of a massive hemorrhage from a duodenal ulcer nearly four weeks after a traumatic extraperitoneal rupture of the bladder with extravasation of urine The patient had seemed to be convalescing, notwithstanding the severe lesion of the bladder and the adjacent regions This case recalled so forcibly my early experience of a similar character that I entered upon a more careful study of the etiology of these post-operative gastro-intestinal lesions, which within a few years past have attracted surgical attention

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\* Read before the American Surgical Association, May 4, 1908

† Proceedings of the Philadelphia County Medical Society, 1887, p 8, Maryland Medical Journal, Baltimore, 1886-7, xvi, 259 and The Polyclinic, Philadelphia, 1886-7, iv, 246

DEATH FROM PERFORATING GASTRIC ULCER TWO MONTHS AFTER  
SUPRAPUBIC LITHOTOMY

CASE I —In 1886 I operated in the Pennsylvania Hospital on a very fat man, with a poor circulation, aged 63 years, and by a suprapubic cut easily removed a large flat stone from the bladder. The bladder wall, the rectus muscles and the skin were closed by three tiers of catgut sutures, and a drainage-tube was inserted to drain the space between the anterior wall of the bladder and the pubic bone. The wound was dressed with gauze wet with a solution of mercuric chloride, after its edges had been dusted with iodoform. A catheter was kept in the urethra and bladder for twenty-four hours.

Some time before the lithotomy I had attempted to crush the stone with the lithotrite after having accustomed the capacious urethra to the contact of instruments by passing bougies. The stone was, however, too large to be grasped by the lithotrite and litholapaxy was abandoned. After a proper period of inactivity I etherized the man and introduced a rubber bag into the rectum and elevated the bladder by injecting twelve fluidounces of warm water into the bag. The bladder was then distended with from six to eight fluidounces of weak solution of mercuric chloride and the suprapubic opening made. The layer of fat in the superficial fascia was nearly two inches thick. The technic of these operative procedures was that usual at the date of operation. They seem somewhat antiquated now.

In about five days the drainage-tube was withdrawn and by the eighth day all the sutures in the skin were removed. Some urine escaped from the opening left by the drainage-tube, though the bladder was frequently emptied with a catheter. On the evening of the eighth day the patient vomited about six fluidounces of blood. During the straining of vomiting on that day and on account of sitting up in bed a few days later, the wound burst open throughout its entire length. The edges of the reopened wound were brought together by sutures of silk-worm gut and shot.

The man's local condition continued pretty good, though his general condition was bad. The deep part of the wound closed and he passed urine normally by the urethra without any escape through the hypogastric cut. The wound in the skin and fat,

however, was covered with sluggish granulations and repair therein was very inactive. The patient had persistent nausea, a dull uncomfortable feeling in the epigastrium and a marked loss of appetite. Disease of the liver or stomach was discussed, but no diagnosis was reached. This was due probably to the fact that twenty odd years ago surgeons were not so familiar with gastric ulceration as now. Efforts were made to improve his nutrition without much avail. Gradually he improved sufficiently to sit up in a chair daily, and the wound in the abdominal wall was almost completely healed. He had no urinary difficulty and was very comfortable except for great weakness and the continuance of pain at the epigastrium.

Two months after operation he was suddenly seized with intense pain in the epigastrium. This was immediately followed by profound shock, which continued without reaction until death occurred a few hours later. The necropsy disclosed a gastric ulcer, about one and a quarter inches in diameter, which by perforation had permitted the contents of the stomach to escape into the peritoneal cavity.

#### DEATH FROM DUODENAL ULCER NEARLY FOUR WEEKS AFTER RUPTURE OF THE BLADDER

CASE II — In February, 1906, a man of 23 years was admitted to the Polyclinic Hospital with fracture of the pelvis and extra-peritoneal rupture of the bladder, caused by some iron beams falling upon him. There was a fracture at the pubes and a fracture or dislocation posteriorly. Marked extravasation of urine and severe hemorrhage took place into the tissues in front of the bladder, causing a large elliptical swelling to develop above the right Poupart's ligament. This swelling, which extended from the middle line towards the crest of the right ilium, was drained by a seven inch incision, above Poupart's ligament, and the introduction of a large drainage-tube. Urine escaped freely from the drainage-tube and was withdrawn from the bladder by urethral catheterization for about two weeks. At the end of three weeks the tube was removed, because the temperature, as well as the local condition and the general symptoms of the patient, seemed to warrant the belief that serious septicæmia had been averted and that recovery would take place. The patient gave a history of two attacks of gonorrhœa, the last of which

occurred two years before. His urine showed a trace of albumin and red blood cells when examined after the injury. Later it contained pus and streptococci. His temperature was normal when he was admitted. Then it oscillated and about a week after his injury reached  $103^{\circ}$ . Later it was from normal to  $100^{\circ}$ .

The man gained strength, though he was pale, the wound in the abdominal wall closed, and his bladder was able to take care of urination, expelling as much as twelve fluidounces during a urination. The urine contained some pus. The normal temperature and the rather frequent pulse showed nothing to excite special anxiety. The patient on the twenty-second day complained of some pain in his upper abdomen, but he slept fairly well, though a little restless and weak.

On the twenty-sixth day he had a sudden collapse, shown by a weak irregular pulse, rapidity of respiration and free sweating. When I saw him a few hours later he was greatly prostrated and said that he felt as if he were being blown up inside his abdomen. He was evidently going to die. Catheterization obtained a considerable quantity of urine of a normal appearance. I was at a loss to explain the symptoms. He died early the next morning, despite active stimulation, with sudden symptoms of another collapse.

The necropsy was made by Dr. John M. Swan, the Clinical Pathologist of the Hospital. The important findings were:

The pelvic peritoneum was discolored a bluish-black. The discoloration extended upwards on both sides well towards the diaphragm. This was probably due to the extravasation of blood, which occurred when the pelvic girdle gave way posteriorly at the time the man was crushed under the falling iron. There was no fluid in the abdominal cavity. The retroperitoneal lymph-nodes were slightly enlarged.

The bladder was empty except that it contained a very small quantity of very purulent fluid. It was ruptured in front just above the prostate gland and communicated through this opening with a large cavity running between the separated portions of the pubic bones, the ends of which were bare and roughened. The cavity extended downwards and backwards to the right along the ramus of the pubes and ischium as far as the tuberosity of the latter. In addition there was an extension of the septic

cavity down the side of the right thigh to a point four inches below the groin

The intestines were greatly distended everywhere except at the sigmoid flexure where there was a marked contraction. The large intestine was very much distended and contained a large quantity of blood-stained contents, its mucous membrane, which was thickened and reddish, was studded with minute elevations with a blackish centre and was intensely stained with extravasated blood. The small intestine contained a small amount of blood-stained material. In the jejunum the mucous membrane showed the normal rugæ stained red. The mucous membrane of the ileum was quite red, becoming in some places dark brown, at the lower part of the ileum the staining became quite black. On the posterior wall of the duodenum just below the pyloric ring was an ulcer about three-quarters of an inch in diameter. It was rounded with undermined edges, in its bottom there was a small area, which appeared to be covered with a small blood clot. When this clot was removed, an open blood vessel, almost two millimetres in diameter, was seen. The base of the ulcer was almost directly against the pancreas, which is here normally adjacent to and connected with the duodenum.

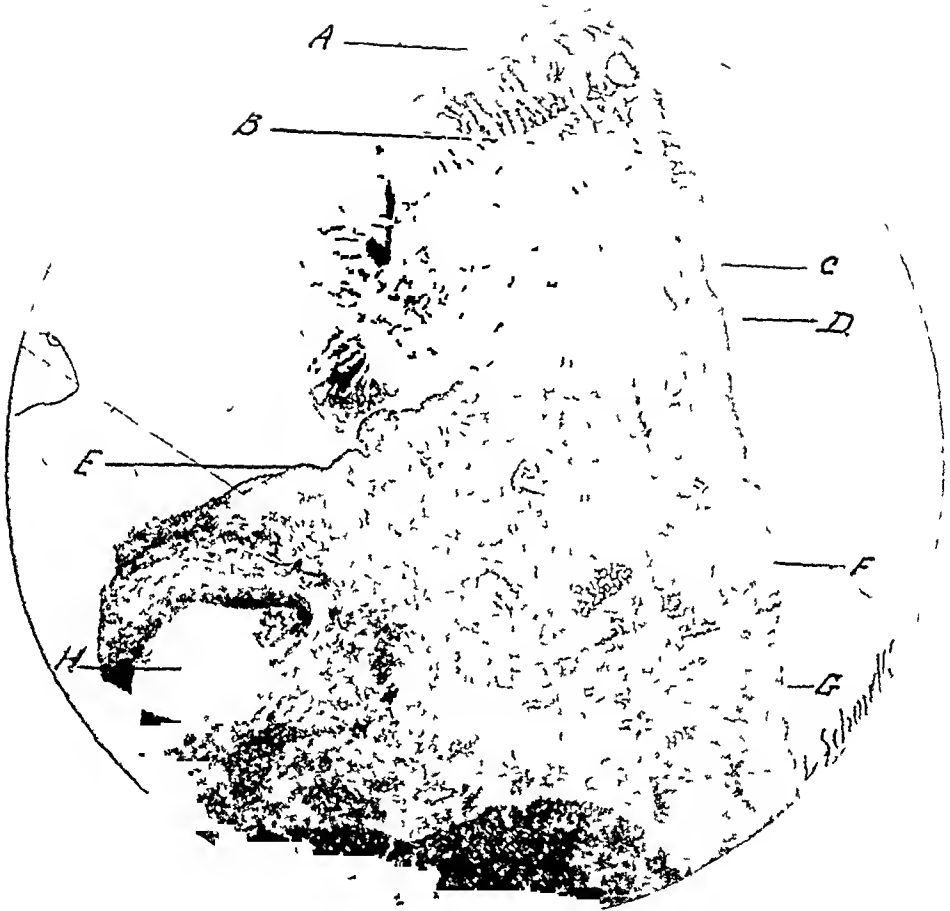
The stomach was distended with a large quantity of blood and blood-stained food particles. The large amount of clotted blood formed almost a complete cast of the stomach. The gastric mucous membrane was coated with mucus and was blood-stained. No ulcers were present.

The pancreas was fatty, as was the liver. The pancreas, spleen, kidneys and liver were anæmic. The lungs were hypostatically congested and cedematous. The arch of the aorta showed atheroma, the myocardium was anæmic.

The organic lesions found were fracture of the pelvis, extra-peritoneal rupture of the bladder, chronic abscess of the pelvis and perineum, acute colitis, ulcer of the duodenum with hemorrhage and hemorrhagic infiltration behind the peritoneum. The cause of death was profuse hemorrhage into the alimentary canal.

Careful questioning of the young man's mother after his death failed to elicit any history of previous spitting or vomiting of blood. She insisted that he had never had pain or indigestion after eating, even when taking sour or highly seasoned food. I therefore reached the conclusion that the colitis and the fatal

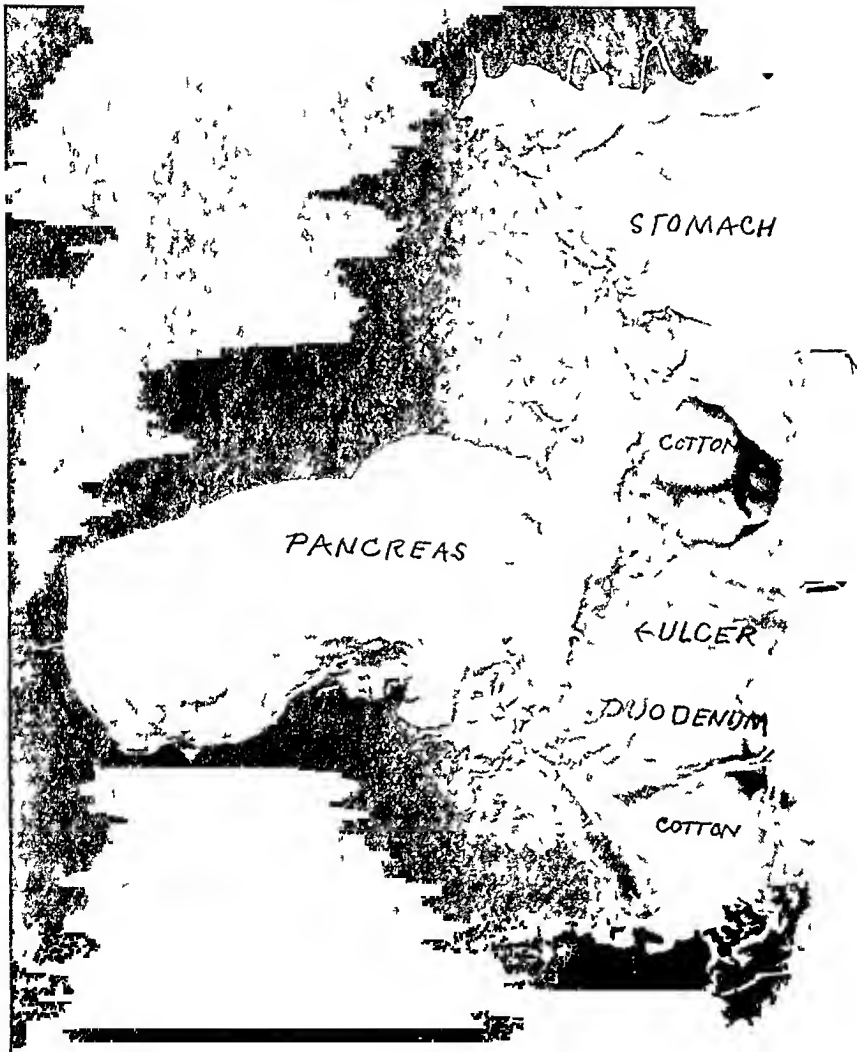
FIG 1



Microscopic view of tissue from wall and floor of ulcer of duodenum A, mucosa B, glands of Brunner, C, circular, and D, longitudinal muscular fibres E floor of ulcer, F, fibrous connective tissue between intestine and pancreas G pancreas H, artery from which hemorrhage occurred



FIG 2



Duodenal ulcer secondary to rupture of bladder Dr Roberts case Stomach and duodenum distended with cotton pancreas displaced to display specimen which is mounted in gelatin in a flat jar

ulceration of the duodenum were sequences of the pelvic suppuration resulting from the rupture of the bladder, similar to duodenal ulceration which occurs at times subsequent to burning or freezing of the surface of the body. It must be admitted that the mother's decided negations may have been inspired by the fact that her son had been injured by an accident, and that she therefore may have wished to accentuate his previous healthy condition.

Dr James A. Kelly, the surgical pathologist of the Polyclinic Hospital, made a microscopic examination of the ulcerative process and mounted the specimen for macroscopic inspection. He says:

"Microscopic examination of tissue removed from side and floor of ulcer of duodenum shows normal mucosa, submucosa and muscular layers of duodenum forming side of ulcer, excepting for moderate round-cell infiltration of all layers and some deposit of fibrin and blood on surface of mucosa. At the site of the ulcer all the layers of the duodenum have been destroyed and replaced by necrotic tissue containing a few leucocytes and fibrin. The floor of ulcer below necrotic area is made up of fully formed adult connective tissue and is firmly adherent to pancreas. The section contains a cross-section of the artery, from which hemorrhage occurred and which does not show any signs of embolus or thrombus. The fibrous tissue indicates in my opinion an ulcerative process not of recent date" (Fig. 1)

It may be contended that in both of these cases the gastrointestinal ulceration had existed previously to the traumatism of the bladder. Two months and nearly four weeks respectively, however, might, it would seem to me, be sufficient time to develop an ulcer having characteristics similar to those seen in the usual chronic peptic ulcer of the stomach and duodenum. No microscopic examination was made in the first case, in the second Dr. Kelly's report is appended. He, however, gives no definite opinion as to the exact age of the lesion, though he looks upon it as a chronic sore. I do not know that pathologists possess exact information as to the time really required to produce the histological changes seen in the section. It is known, however, that after gastrojejunostomy peptic ulcer of the jejunum may occur very early. Mr. Moynihan has re-

corded <sup>1</sup> death from perforation of such a jejunal ulcer about eleven days after operation, and mentions that he knows of a case in which such a fatality took place in five days after operation. These instances apparently indicate that four to eight weeks was not too short a time in which to have developed the ulcerations found in my cases here reported.

It is impossible to fix the time of origin of these lesions and indeed their pathological connection with the bladder traumatism may be disputed. Three possibilities present themselves to one's mind.

The ulcerative process might have no connection whatever with the suprapubic lithotomy in the one patient or the accidental injury of the pelvic structures in the other.

The operative and accidental disturbances might on the other hand be the direct cause of the cytological and histological changes leading to hemorrhage, ulceration and perforation. A difficulty of explaining this relation by present pathological knowledge does not preclude the possibility. Thrombosis, embolism, toxæmia, and other influences of circulatory and nervous origin might readily lower the resistance of the cells of the mucosa to the digestive action of the fluids of the stomach and duodenum, and open the way to autodigestion and ulceration.

The surgical disturbance of the patient's structures, might in the third place be the cause of a renewal of activity in a latent or healing ulceration. Varicose veins in the mucosa of œsophagus, stomach or duodenum and congestion of the portal system from hepatic cirrhosis or heart disease, or general arteriosclerosis might be contributing causes.

I insert here brief notes of cases similar to those just reported by me, which I have collected from literature.

CASE III—*Suprapubic Lithotomy followed by Death from Hæmatemesis Eight Days after Operation, Small Gastric Ulcer*. BROCA reports <sup>2</sup> the following case. A man 65 years old, not manifestly an alcoholic, had been in previous good health except that for seven years he had symptoms

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<sup>1</sup> Trans. American Surgical Assn., 1908.

<sup>2</sup> Bull. et mem. de la Soc. de Chirurgie de Paris, 1900, LXXVI, 858.

of vesical stone. He applied for hospital treatment because fifteen days previously he had had marked hæmaturia lasting a whole night. The patient was rather fat and showed no vesical symptoms, except a slight degree of pulmonary emphysema. By suprapubic lithotomy Broca removed on October 16, 1891, a large uric acid stone. He sutured the bladder, leaving a large tube in the bladder for drainage. On the third day, the temperature being  $38^{\circ}$  C, the patient was doing well, though some urine was escaping by the hypogastric wound. Local and general conditions were good until the evening of the sixth day, when, without suppuration in the wound and without fever, an abundant hæmatemesis took place. This was treated with ice externally and internally and ergotin. The next morning the patient was very feeble and very pale, but, on the following day, which was the eighth after operation, hæmatemesis and the passage of blood in the stools occurred and he died in the evening.

Necropsy showed stomach and intestine full of blood. No definite ulceration in the stomach was at first evident. No œsophageal varices and no evident vascular rupture were found, but the whole gastric mucosa presented a marked wine color tint. Transmitted light revealed on the greater curvature at the junction of two vessels, an ulcer as large as a lentil. The abdominal wound was normal, showing no suppuration, and the vesical wound was united except at the point where the drain prevented union.

The liver appeared macroscopically to be normal but histological examination showed beginning cirrhosis. Atheromatous change was very clear in the coronary arteries of the heart and in the aorta. Renal sclerosis was present. The stomach submucosa was infiltrated with interstitial hemorrhages and its vessels were atheromatous. The only pathological change explaining the lesion and the hæmatemesis was arterial atheroma.

**CASE IV—Lithotomy Associated with Chronic Nephritis and Duodenal Ulcer, Death in Two Days.** PERRY and SHAW give<sup>3</sup> the history of a man aged 62 years who had had symptoms of stone in the bladder for eight years. After lithotomy, probably perineal, two large calculi were removed from the bladder. The man had delirium and died in two days. The autopsy showed tubal nephritis and a duodenal ulcer just beyond the pylorus with a linear cicatrix around it. The ulcer was considered by the reporters to be an old ulcer which had partially healed.

**CASES V and VI—Duodenal Ulcers Associated with Pyonephrosis and Perinephric Abscess.** *Duodenal Ulcer Associated with Perineal Abscess and Scrofulous Kidney.* The same authors report two other cases of duodenal ulcer found in patients dying with septicæmia associated with disease of the kidney of various types. In one of the cases there was pyonephrosis and perinephric abscess, in another a perineal abscess associated with a scrofulous kidney.

<sup>3</sup> Guy's Hospital Reports, 1893, p. 187—

CASE VII—*Litholapaxy followed by Hæmatemesis Death on Third Day* PURVES reports a case operated upon by Annandale<sup>4</sup> The patient, a man of 67 years, had no gastric trouble previously Urine was normal On October 18, 1900, a uric acid stone was crushed and removed There was no vomiting from the chloroform administered as an anæsthetic Three hours after the operation the man vomited a small amount of coffee-ground colored fluid without severe retching and without pain On the next day he complained of some epigastric discomfort. The following day he was better There was no pus in the urine Sixty hours after operation the man vomited 10 ounces of black fluid, became collapsed, and had an intermittent pulse and some distention of the abdomen He was treated with strychnia, strophanthus and lavage of the stomach with hot water He fell in collapse again and died without further vomiting five hours later No autopsy was made The reporter is not certain that sepsis was present in this case, but the man's general condition and the tympanites make it, he thinks, very probable

CASE VIII—*Lumbar Nephrotomy followed by Hæmatemesis Death in Thirty-six hours* In the same article is recorded another case occurring in the service of Annandale in 1901 A man of 50 years had suffered with renal colic for 11 years There was no history of gastric trouble After lumbar nephrotomy for renal calculi which was unaccompanied by chloroform vomiting, the man vomited blood This occurred 18 hours after operation and the patient died 36 hours subsequent to that procedure The urine had been found purulent but there was no mention of a chemical examination having been made The autopsy showed pus in the kidney No ulceration was found in the stomach or duodenum

CASE IX—*Suprapubic Lithotomy, Hæmatemesis Death on the Third Day Two Ulcers found in the Stomach* PURVES in the same collection records the history of a patient operated upon by Chiene A man of 62 years had exhibited symptoms of vesical calculus for three years He recently had developed a cystitis but had never passed blood in the urine The urine was purulent There was no history of gastric trouble Chiene did a suprapubic lithotomy in 1893 and drained the bladder There was some vomiting from the chloroform Forty-six hours after operation the patient vomited clotted blood in large quantity and died 54 hours subsequent to operation The autopsy revealed extensive atheroma The stomach and upper part of the intestine contained dark blood Two old ulcers were situated on the lesser curvature of the stomach An arterial branch close to one of the ulcers had a clot in it discolored by stomach contents, but no perforation in the vessel could be established There was calculous pyelitis of the right kidney

CASE X—*Lumbar Nephrotomy followed by Hæmatemesis Fatal on the Third Day* PURVES also mentions in the same article another case operated upon by Annandale In this instance the man was young, being only 27 years of age Two uric acid calculi were removed from the right kidney, presumably by lumbar nephrotomy The chloroform sick-

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<sup>4</sup>Edinburg Medical Journal, 1902, lxx, p 238

ness, which was slight at first, increased in frequency on the following day and became more violent in the next 24 hours. Forty hours after operation, black fluid containing blood replaced the bilious vomiting and continued until death 52 hours after operation, which was 12 hours after the onset of hæmatemesis. There was no autopsy and there is no mention in the report as to whether there had been previous symptoms of gastro-intestinal trouble. There is no statement as to the coincidence of suppuration or septic symptoms. The fact that the bloody vomit replaced a previous bilious vomiting would, perhaps, indicate that the lesion was duodenal rather than gastric.

This collection of cases from one city and in the practice of two surgeons, connected with one hospital, indicates that the condition is probably not unusual. A careful search of clinical records will probably result in the discovery of many additional instances.

Guyon reports<sup>5</sup> three cases of hæmatemesis after urinary infection. Recovery took place in two of the cases, and hence no exact knowledge of the gastro-intestinal lesions is possible in those instances.

*CASE XI—Hæmatemesis Preceding Death from Coma in a Patient with Urethral Stricture Genito-Urinary Infection.* A man of 71 years came under the observation of Guyon on February 19, 1901 in a comatose state with evidences of advanced urinary infection, but not in a condition for operative treatment. Repeated, violent hæmatemesis occurred, and he died in coma on the second day. Autopsy showed urethral stricture and ulceration, cystitis and phlegmonous pericystitis, abscess in the bladder wall, ureteritis and pyelitis. The kidneys macroscopically did not seem much damaged. The stomach was filled with blood. No ulceration of the gastric mucosa appeared to exist, nor was any lesion found in the œsophagus or duodenum. There was merely a bloody effusion in the submucosa of the stomach in the pyloric region, without evident solution of continuity of the mucosa. Histological examination had not been made at the time of the report. The intestinal canal was otherwise normal macroscopically. There was no peritonitis, no appendicitis, and no evident lesion macroscopically of liver, heart, or spleen. The lungs were slightly congested at base. Microscopical study had not been made.

*CASE XII—Hæmatemesis after Perineal Incisions for Extravasation of Urine in Urethral Stricture Recovery.* A man of 55 years was

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<sup>5</sup> Sur les hématoméses toxi-infectieuses. Bull. de l'Académie de Médecine, 1901, xlv, 226.

operated upon by Guyon in 1878 for stricture of urethra by internal urethrotomy. In 1896 he suffered from infiltration of urine after mala-

droit catheterization Incisions were made in the perineum and he rapidly improved When he was supposed to be out of danger an abundant vomiting of blood occurred The blood was mixed with blackish clots Recovery took place under the use of ice by the mouth No recurrence has taken place The man was seen at various times for several years afterwards

CASE XIII—*Hæmatemesis after Suprapubic Removal of a Vesical Tumor Recovery* A man, aged 53 years, had a urethral stricture, which had been successfully treated by gradual dilatation in 1894 Guyon states that about seven months later he complained of bloody urine, which was said to have existed for two years In July 1895 a growth was removed from the bladder by a suprapubic cut A few days later the patient had quite abundant hæmatemesis which disappeared spontaneously in two or three days and did not return The man was septic and had at the end of a month a phlebitis of the left leg which lasted about six weeks He was not seen again after he left the hospital

CASE XIV—*Fatal Intestinal Hemorrhage after Lumbar Nephrotomy* SUMMERS<sup>6</sup> operated upon a woman, aged 25 years, who was six months pregnant, for an acute pyonephrosis of the right kidney He made a vertical cut in the loin One week later the infection occurred in the left kidney also, which he similarly drained There was more than usual manipulation of the mesocolon on the left side, though the peritoneum was not opened It was observed that on that side the colon had a short mesocolon Twenty-four hours later abortion took place On the fourth day after the second lumbar nephrotomy terrible intestinal hemorrhages occurred, resulting in death No macroscopic ulcerations were found in the descending colon, but the mucosa was blood-stained No further necropsy findings are mentioned

Noble and Wathen have, according to Rodman<sup>7</sup> each seen fatal gastric hemorrhage after nephrorrhaphy The record is as follows

CASE XV—*Gastric and Intestinal Hemorrhage after Bilateral Nephrorrhaphy Death on Twelfth Day* NOBLE operated on a young woman for fixing the kidneys and lost his patient on the twelfth day from hemorrhage from the stomach and bowels No autopsy was obtainable

CASE XVI—*Death from Gastric Hemorrhage after Nephrorrhaphy* WATHEN saw hæmatemesis occur over a week after an operation for fixing the movable kidney of a young neurotic woman Death took place two or three days later No autopsy was held

In this series I have collected 16 instances of gastro-intestinal bleeding subsequent to operative or other lesions of the

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<sup>6</sup> Medical Herald, St Joseph, Missouri, November, 1906

<sup>7</sup> Philadelphia Medical Journal, June 19, 1900

urinary organs The result was death in 14 cases, recovery in 2

There were operations for cystotomy, 5, for litholapaxy, 1, for nephrotomy, 3, for extravasation of urine, bladder or urethra, 2, for nephrorrhaphy, 2

There were nonoperative lesions in three, viz pericystic abscess, etc., 1, perinephric abscess, etc., 1, perineal abscess, etc., 1

In 7 of the 10 fatal cases ulceration was found at autopsy, in several of the remaining cases no necropsy was made and the question of the presence of ulcer of the stomach or intestine remains undetermined

Curling said sixty-four years ago in his classic paper<sup>8</sup> on duodenal ulcers secondary to burns of the skin "I have seen ulcers of this form in the same part of the intestine in other cases besides burns" In discussing duodenal ulceration after burns he called attention to the tendency of the ulcers to be situated in the first part of the duodenum and on its posterior wall, where it is close to the pancreas He said that the ulcer is apt to have the pancreas for its base and that a large open vessel is often seen on the floor of the ulcer In most of the cases reported by him death occurred in from seven to ten days after the injury He raised the question of a possible connection of the ulcerative process with Brunner's glands In a woman, who died late of burns, he saw a healed ulcer in the duodenum, which he considered to be the scar of a lesion consecutive to the burns

Curling shows that Dupuytren had noted the occurrence of intestinal ulceration after burns, but calls attention to the fact that he did not seem to have recognized the special liability of the duodenum to this pathological process It is interesting to note the similarity of the lesion in the second case of wound of the urinary bladder recorded by me in this paper with that described by Curling as a sequel to burns

Little or no attention appears to have been paid by clinical observers or pathological investigators to Curling's statement

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<sup>8</sup> Medico-Chirurgical Transactions 1842, vii, 277



that duodenal ulcer was at times a sequel of other surgical lesions than burns

For many years I have regarded the gastric bleeding and ulceration, which killed my suprapubic lithotomy case of 1886, as an evidence of a pathological sequence similar to that which takes place in the duodenum after extensive burning and, I believe, also after extensive destruction of the integument from freezing<sup>9</sup> The advent of antiseptic and aseptic methods in surgery has apparently been responsible for a marked elimination of duodenal ulcers secondary to these conditions Whereas Holmes and Collins found this sequel in about 12 per cent of their collection of burns, Lockwood has later found only one such ulcer in 138 cases treated with more or less successful attempts at antiseptics<sup>10</sup>

Hæmatemesis and intestinal bleeding, as well as secondary ulceration of the stomach and duodenum, have attracted the attention of surgeons within recent years as symptoms seen occasionally after intraperitoneal lesions Thus Dieulafoy, Eiselsberg, Lieblein, Kehr, Rodman, Summers, Macrae, Bogolubow, Purves, Sauvé and others have written on their connection with hernia, appendicitis, gall-bladder and gall-duct disease, and operations involving the great omentum or mesentery

The association of these symptoms with lesions of a surgical nature unconnected directly with the peritoneum has, however, not been studied very thoroughly This is rather strange, since, as has been stated, Curling referred to the subject over a half century ago Samuel Fenwick and S W Fenwick do, however, devote a few pages<sup>11</sup> to secondary ulcers of the stomach and duodenum They say that they are associated with infective disorders, portal obstruction, and trauma, but seem to lay most stress on their septic origin

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<sup>9</sup> Deutsche Chirurgie, Lieferung xvii, Ueber Verbrennungen und Erfrierungen

<sup>10</sup> Journal of the American Medical Association, Aug 4, 1906

<sup>11</sup> Ulcer of the Stomach and Duodenum and its Consequences, Philadelphia, 1900, p 146 and 158

In 1893 Perry and Shaw<sup>12</sup> made this statement. "The association of ulceration of the duodenum with general septic or pyæmic conditions has not, so far as we know, attracted attention in this country, although the fact that such an association existed was long ago suspected, we believe, by Billroth." These writers reported 18 ulcers of the duodenum to illustrate this connection out of a total of 70 duodenal ulcers from all causes in Guy's Hospital. They had knowledge of 3 additional cases not occurring in that institution, making in all 21 duodenal ulcerations in septic conditions. The septicæmia was the result of sloughing of the scrotum, perineal abscess, perinephric abscess, bed-sores, middle ear disease, cellulitis, sloughing of the skin, puerperal sepsis and various other affections. The same authors attribute<sup>13</sup> to Moxon the suggestion that duodenal and gastric ulcers are often associated with nephritis, and as evidence report autopsy records of 12 cases of ulcer of the duodenum associated with nephritis in Guy's Hospital, and 4 additional cases collected from other sources. Of the 12 patients, 7 showed interstitial nephritis, 4 tubal nephritis and 1 interstitial and tubal nephritis. Lecomte, Mathieu & Roux, Imerwol and others have studied this question more recently.

The etiology of the gastro-intestinal lesions under consideration is obscure, but it is probably usually, though not always, connected with the occurrence of thrombosis and embolism due to septicæmia or toxæmia. Septic and urinary conditions giving rise to ammonium salts in the blood in large amounts have been especially accused as etiological factors. Cases are mentioned of such hemorrhage and ulceration occurring after operative procedures on regions far away from the abdomen and pelvis. Fracture of an extremity, excision of the Gasserian ganglion, amputation of the thigh, removal of neuromatous tumor, excision of malignant disease of the palate and tonsils, and other surgical traumatism followed by hæmatemesis or

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<sup>12</sup> Guy's Hosp Reports, 1893, 187

<sup>13</sup> Guy's Hosp Reports, 1893, 190

bleeding from the bowel have been reported a few times. These cases apparently prove that the postoperative bleeding and ulceration of the gastro-intestinal tract are caused by some more general pathological influence than local interference with the abdominal and pelvic circulation alone. Experimental and clinical evidence of such hemorrhage and ulceration occurring through infection with the pneumococcus, the meningococcus, the diphtheria bacillus, the colon bacillus, a staphylococcus, and from uræmic conditions give credence to the theory that changes in the gastric and intestinal mucosa leading to fatal issue may be the result of several local influences and also of a widespread pathological alteration in the cells and fluids of the body.

Letulle suggested<sup>14</sup> in 1888 that gastric and duodenal ulcers might be due to a previously existing infectious disease, from which the patient had recovered more or less recently. He mentions as confirmatory of this idea instances of ulcer subsequent to antral suppuration in the upper jaw, smallpox, suppurating lymphangitis of lower extremity, chronic glanders. Gonorrhœa had existed in the second of my cases here reported.

Nearly all the papers on this topic have discussed the questions from the idea that the operations causing the secondary phenomena under discussion must in some direct way involve the portal circulation. Although such lesions are probably more apt to occur after interference with the pelvic and abdominal organs, which are connected with the portal circulation, enough cases are on record to lead to a belief that a general condition, such as uræmic intoxication, atheroma of the vessels, toxæmia, or infection, is instrumental in rendering the patient liable to the serious complication discussed. Investigation has been made by a number of experimenters upon the production of gastric and duodenal ulcers by interference with the nervous connections of the gastro-intestinal tract. In operative cases the high pelvic position of Trendelenburg may perhaps have an influence in disturbing the gastric and duo-

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<sup>14</sup> Acad. des Sciences et Soc. med. des hôpitaux, 1888, quoted by Debove and Renault in *Ulcère de l'estomac*, Paris, 1892, p. 60.

denal circulation and causing congestion of, or extravasation in, the mucosa

Hort, of Torquay, makes the suggestion that some forms of gastric and duodenal ulcers may be only local expressions of a general blood disease not heretofore recognized. His paper states that the occurrence of such ulcers depends upon a break-down of the normal immunity of the gastric mucosa against autodigestion through destruction of the antipeptic bodies caused by thrombosis, embolism, necrosis or other processes.

The ulcer itself is due apparently in his opinion to the presence in the blood of floating hæmorrhagins, mucolysins, and other cystolysins, affecting the mucosa through one of two channels—either from the lymph-stream constantly flooding the epithelial cells with the specific toxins (mucolysins) or from the escaped blood charged with the same bodies.

Purves believes that the condition is frequently an obvious toxæmia from a recognizable septic infection of the wound.

In these cases which I am discussing there is possibly a uræmic toxæmia in addition to the septic toxæmia and infection. The mechanism of the thrombotic or embolic processes may therefore be more readily accounted for.

The serious prognosis in postoperative hæmatemesis or bloody stools is to be insisted upon.

Purves says that the more marked the septic reaction in the wound, as shown by its discharges and the high temperature of the patient, the better is the chance for the patient's recovery. He believes that a subdued or masked infection, with subnormal temperature, frequent pulse, a rapidly increasing vital depression and vomiting tending to become regurgitant, renders the prognosis graver. In his opinion the occurrence of bilious vomiting after one or two attacks of bloody vomit indicates a favorable outcome of the case.

The treatment may be divided into the prophylactic, general, and local. The recognition of the fact that the bleeding

<sup>15</sup> Lancet, 1907, II, 1744

in some cases at least may be due to trauma of the vessels of the mesentery or great omentum suggests that the intra-abdominal organs should be handled with the utmost gentleness in all operative procedures. The probability that sepsis is the basis of this unfortunate complication in a great proportion of cases makes it desirable that all wounds, operative or accidental, intra-abdominal or extra-abdominal, be kept aseptic or quickly be made so. These two precautionary measures are the prophylactic means that the surgeon should always have in mind.

The general treatment consists in relieving the grave anæmia and the depression which result from the loss of blood, whether it be retained within the stomach and intestines, or ejected by vomiting or stool. When there is no external evidence of bleeding by hæmatemesis or bloody dejections, the surgeon may fail to recognize the cause of the sudden collapse of his patient. The occasional advent of postoperative gastrointestinal bleeding should always be remembered. Hypodermic injections of strychnia, rectal enemas containing alcohol or other stimulants and nutritive materials, and, perhaps, the use of ergotin subcutaneously, are indications in this instance as in other cases of hemorrhage. If the patient has been in the high pelvic position, and it is believed that congestion of the stomach and intestines is increased by this posture, he should be restored to the horizontal position. This change in posture should be made gradually. It may, however, be improper, if there is danger of cerebral anæmia resulting from the altered posture. It is possible that in some instances elevation of the shoulders and head so that the patient occupies a semi-sitting posture may be thought wise. This may lessen a congestion of the liver, stomach and duodenum, if it be due to cardiac disease, for example, by increasing the hypostatic congestion of the pelvic organs and lower extremities. Cording the limbs so as to increase their venous congestion may perhaps aid in a similar manner. Autotransfusion, so-called, induced by applying bandages of rubber to the four extremities so as to drive the blood from them may be available in increasing the

amount of blood in the brain and medulla oblongata Hypodermoclysis or intravenous injection of warm saline solution or arterial anastomosis with a healthy individual may be valuable in selected cases It is not impossible that instances might arise in which phlebotomy may be justified to relieve the engorgement of the right heart, the liver and the mucous membrane of the gastro-intestinal tract

Local measures should consist in total abstinence from the introduction of food into the stomach, though nutrient enemas may be employed The stomach should be cleared of clotted blood and acid secretions by irrigation with a 2 per cent sodium bicarbonate solution of a temperature of from 110-120° F Rodman has recommended that the stomach be washed out with hot water of 120-130° F<sup>16</sup> After the stomach has been emptied of its contents by repeated irrigation, nitrate of silver solution 1-1000 has been employed through a stomach tube and followed by ice cold water irrigation It would seem to me that the hot water treatment is better than that by ice cold water Ice has been applied to the epigastrium in some cases High enemas of hot water have been given for the purpose of clearing out the bowel and aiding in the arrest of the bleeding Full doses of bismuth subnitrate might be given by the mouth with advantage The use of adrenalin and cocaine solutions introduced into the stomach has been suggested, but their value may be considered doubtful

Most writers on the subject under consideration have looked upon the surgical treatment of the bleeding point as unwise They have usually counselled a reliance upon medical measures such as those already described It is conceivable, however, that, if the condition of the patient warranted it, local treatment of the ulcer in the stomach or duodenum should be instituted

Gastro-enterostomy, excision of the ulcer, or ligation of the bleeding point suggest themselves An incision in the stomach opposite to the bleeding point would, perhaps permit the surgeon's finger, placed behind the ulcer, to push the bleed-

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<sup>16</sup> Jour Am Med Assn, Sept 15, 1906, p 842

ing surface through the opening and enable him to encircle the vessel with a purse-string suture carried through the mucous membrane and submucous coat

Summers once operated by opening the abdomen, incising the stomach and irrigating it with hot water. The patient seemed to be benefited, but the hemorrhage recurred and death finally took place. He suggests the possibility of using with advantage continuous irrigation, either through the œsophagus, or through a fistula made in the stomach

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# INFANTILE HYPERTROPHIC STENOSIS OF PYLORUS<sup>1</sup>

BY FRANK E BUNTS, M D,  
OF CLEVELAND, OHIO,

Professor of Surgery in the Western Reserve University

AUTHOR reports a case of operation for pyloric stenosis in an infant 4½ weeks old The pylorus was found thickened and hard, and, deeming it impossible to perform a pyloroplasty, an anterior gastro-enterostomy was made The child recovered and is still living eleven months from date of operation

In addition to the 89 operative cases collected by Dr Thompson in 1906, 25 operative cases have been collected by Dr Bunts, and an endeavor made to ascertain the principal causes of death in the various operations performed and to estimate the probable percentage of recoveries and the prospects, if any, of improvement in operative results

Of the total 114 cases, 53 recovered and 61 died, a mortality of 55 per cent, distributed as follows

	Cases	Recovered	Died	Mortality Per Cent
Divulsion	27	13	14	51 8
Gastro-enterostomy	69	32	37	53 6
Pyloroplasty	17	8	9	53
Pylorotomy	1	0	1	100

No improvement but rather a higher mortality was shown in the last 25 cases

The paper concludes as follows

If one would be entitled to draw any conclusions from this résumé, they would be

1 Congenital stenosis and infantile stenosis are of decidedly different clinical significance

2 Congenital pyloric stenosis would in all cases call for very early operative interference

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\* Author's abstract of paper read before the American Surgical Association, May 4, 1908

3 Infantile pyloric stenosis develops after birth and is often amenable to medical treatment, but in the absence of improvement an early operation offers an excellent prospect of recovery

4 There does not seem to be as yet any positive way to distinguish between the congenital and infantile forms. The earlier the symptoms, the more probable the congenital form.

5 In selected cases pyloroplasty offers results superior to those of gastro-enterostomy, and should be the operation of choice.

6 There has been no recent improvement in operative results.

7 The one great determining cause of death in practically all cases is delay, and it is obvious that until this obstacle is removed by the medical attendant, little or no improvement on the present statistics can be expected.

# MELANOTIC SARCOMA OF THE COMMON BILE DUCT AND THE AMPULLA OF VATER

BY FRANCIS J SHEPHERD, M D, F R C S, EDIN. (HON)

OF MONTREAL

Surgeon to the Montreal General Hospital

THE rarity and obscurity of this case constitutes my apology for reporting it

Mr A S, aged 44, bridge engineer, consulted Dr A E Morphy, of Lachine, P Q, in June, 1907, for severe itching all over the body, but especially about the chest and back. On examination a very faint tinge of yellow was observed in the skin and conjunctivæ. There was no digestive disturbance but distinct loss of appetite. A few days later the jaundice deepened and the itchiness increased. There was no pain, but the patient complained of loss of strength, great lassitude and much depression of spirits. There was also constipation. On physical examination, when first seen by Dr Morphy, no abnormal condition about the liver was discovered, everything seemed normal.

About the middle of July a smooth, rounded, painless swelling was made out in the region of the gall-bladder. This was looked upon as a distended gall-bladder. All this time there was abundant bile in the urine and the stools were colorless and very fetid, except occasionally when they had a chocolate hue.

Mr S was admitted under my care as a private patient in the Montreal General Hospital, July 26, 1907, the following being his history. A tall, spare man, of very fair complexion, had never been ill before in his life and had always been most athletic, being very fond of outdoor sports. He was in his usual health until May 15, 1907, when his feet began to itch at night. This itching spread all over his body and very soon (early in June) his conjunctivæ became yellowish in color and then his whole skin became jaundiced. The color deepened rapidly, and at the time this note was made his color was more yellow than it had previously been, the itching was less troublesome but he complained

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\* Read before the American Surgical Association, May 5, 1908

of great depression and weakness. He never had any severe pain in the abdomen, nor headache, but complained of a sensation as if a rope was being tied about his abdomen below the costal margin accompanied by a dull ache, especially severe when he took a deep breath.

Examination showed that his lungs and heart were normal. The urine contained bile but no sugar or albumin, the bowels were constipated, stools foul and colorless. Has never had any vomiting or fever. Has lost about 35 pounds since illness commenced. Pulse slow, 58. On examination of the liver it was found to be slightly enlarged and a fulness was felt in the region of the gall-bladder, but no distinct tumor was made out.

A question arose as to the cause of this condition and it was felt that it was either due to gall-stone in the common duct or malignant disease. An exploratory operation was advised, and on July 30th the abdomen was opened by a vertical incision through the middle of the right rectus abdominal muscle. The gall-bladder was found fairly distended but no stone could be felt, nor could any nodules or enlarged glands be made out in the common duct, nor was any thickening or infiltration felt. The head of the pancreas was somewhat hard, but nothing definite was discovered, so the gall-bladder was opened and a lot of thick, dark colored bile evacuated mixed with mucus and a dark substance of the consistence of mud. A drainage-tube was left in and nothing more done. My conclusion was, from having had a somewhat similar case the previous year, that a soft secondary malignant growth was blocking the common duct below the junction of the cystic duct, but on careful examination no primary growth could be discovered anywhere. The rectum was normal and apparently all other parts also. It was a puzzling case and explanation was difficult. The tube discharged much bile and his jaundice cleared up considerably, but he continued getting weaker and was more difficult to feed.

A month after the operation his left parotid began to enlarge and soon after pus came from the left ear, a large abscess formed which was opened and discharged freely and much necrosed tissue was taken away. Another abscess formed in the submaxillary region and caused a considerable increase of his debility. He finally died on September 6 1907 of exhaustion.

An autopsy was allowed and the following is an abstract of the findings as reported by the Pathologist of the Hospital, Dr Duval

*Autopsy* performed fourteen hours after death In the region of the gall-bladder there is a linear scar 10 cm in length parallel to the median line Through the scar runs a fistulous tract which communicates with the gall-bladder and on pressure discharges bile The inner surface of the gall-bladder appears normal The cystic duct, opened in situ, is distorted into a shape like the letter S, apparently the result of old adhesions The wall of the cystic duct is of normal thickness and its inner surface smooth throughout On opening the common duct it is seen uniformly dilated to three times its normal calibre Its wall is somewhat thinned and the rugæ of the tunica propria present a marked fenestration, due probably to long continued distention In the lower portion of the duct there is a soft, brownish-black, fungoid mass, 2.5 cm in length, which completely occludes the lumen of the common duct and part of Vater's diverticulum The passageway to the duodenum, however, is patent and normal The tumor throughout its extent is intimately attached to the duct wall and appears to have started in the tunica propria, there is no thickening of the wall The attachment of the growth maintains an even line 2 mm within and along the wall as indicated to the naked eye by the pigment limit (Fig 1)

The tumor is confined entirely to the common duct and ampulla Neither the pancreas nor its duct are involved in the growth There is no similar mass found elsewhere nor were any cutaneous moles found anywhere in the body The common duct was opened in situ over a grooved director to which on passing it down the lumen no resistance was offered, so no occlusion was detected by means of the probe The growth was so soft that only after the duct had been laid open was the obstruction discovered The brownish-black mass now assumed a distinct cylindrical form which bulged far over the edges of the opened duct It was only with great difficulty it could be returned to its original place and the edges of the duct brought again into apposition

At first it seemed as if the tumor was altered blood or inspissated bile, its true nature was discovered, however, after a more careful examination The melanoma on closer inspection showed

FIG 1





FIG 2



Section showing pigment cells

FIG 3



Section showing villi

innumerable densely arranged, flattened, finger-like projections, these floated free from one another at their distal extremities, but remained firmly attached at their base. When the mass was submerged in water the upper and lower limitations of the growth are sharply defined. The tumor with its curious villous structures resembles certain forms of vegetable algæ growing under water. It is noteworthy that no part of the mass could be washed away or the water discolored by the coloring matter of the tumor. On removing the mass from the water the villi immediately collapsed, allowing the tumor to assume again a smooth, dull, black, velvety surface.

*Microscopical examination* showed the growth to be composed almost entirely of pigmented cells. The pigment is most marked on the outer extremities of the villi where the alveolar structure is most pronounced. The cells have a large, distinctly lobulated vesicular nucleus with one or more nucleoli. The nucleolus is always sharply defined and may be very large, often only a narrow rim of nucleus surrounding an enormous nucleolus. When the cell contains little pigment it is small and the nucleus proportionately diminished. The pigment invariably occurs in the form of globules arranged in cell protoplasm equi-distant from one another (Figs 2 and 3).

The pigment differs from that of the melano-sarcomata in that instead of the irregularly scattered masses of the latter it occurs in the form of globules evenly arranged within the cells. The distribution is so regular that it does not seem to be a by-product but rather an integral part of the cell. An occasional small vessel in the submucosa of the common bile duct in close proximity to the tumor contains pigment cells and with this exception the melanotic cells are strictly confined to the main mass. There was no metastasis found elsewhere in the body.

The region below the involved part of the duct showed a well-marked periglandular infiltration of lymphoid and plasma cells, but no pigmented cells of any description. All the gland follicles in the tunica propria above and below the growth showed a low grade of chronic peri-inflammation though other tissues were normal. The villous masses comprising the tumor are covered by a thin, though well-defined connective tissue, enveloped in whose fibrils are elongated cells arranged end to end in unbroken chain. There was no pigment either intra- or extra-cellular in this supporting tissue and in no way does it resemble melanoma.

*Remarks* —The situation of this growth is unusual for a pigmented one, which is apparently primary and whose cellular structure resembles in many ways epithelioma. Secondary melanosarcomata are common in the liver, but no case has

been reported of such a secondary growth in the common bile duct. The gall-bladder and ducts are the more frequent sites for primary sarcoma. We must conclude from the absence of primary growth elsewhere that the melanotic growth arose from cells in the common bile duct.

There is a possibility that at some time there was a dislodgement of one or more pigment-bearing cells from a normal situation which subsequently became arrested at a distant point. In this way we may account for the occurrence of secondary melanoma in an internal organ where no primary tumor actually exists. Of course this theory is open to the criticism that the primary focus had escaped discovery.

# EXPERIMENTS IN FLUSHING THE INTESTINAL CANAL WITH SALT SOLUTION THROUGH MULTIPLE ENTEROTOMY OPENINGS.<sup>1</sup>

A SERIES OF STUDIES ON ANIMALS AND ON HUMAN CADAVERS FOR THE PURPOSE OF DETERMINING WHETHER IT IS PRACTICABLE TO ATTEMPT TO REMOVE A PART, OR THE WHOLE, OF THE INTESTINAL CONTENTS BY WASHING OUT THE CANAL OF THE SMALL INTESTINE THROUGH ENTEROTOMY OPENINGS, SYSTEMATICALLY FROM ABOVE DOWNWARDS, AND, FINALLY, BY WASHING OUT THE COLON FROM THE LOWEST ENTEROTOMY OPENING, THE CONTENTS OF THE COLON AND WASH WATER ESCAPING FROM THE ANUS

BY GEORGE H MONKS, M.D.,

OF BOSTON, MASS.,

Surgeon to the Boston City Hospital, Lecturer in Surgery, Harvard University Medical School

FOR a number of years I have been much interested in what has seemed to me a useful procedure in certain conditions of the intestines; namely, the immediate removal of an appreciable portion of intestinal contents through one or more enterotomy openings. In an article read before this Association in 1903<sup>1</sup> I suggested the possibility of emptying the intestines through a rigid tube upon which a considerable length of the intestines is *gathered*. Later I made further experiments upon the cadaver in reference to this procedure, and published them<sup>2</sup>. In many cases, as has been shown by my own experience, and that of a number of other surgeons who have kindly communicated their results to me, this procedure is quite sufficient to relieve the intestines by removing a large part of their contents

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\* Read before the American Surgical Association, May 6, 1908

<sup>1</sup> Intestinal Localization ANNALS OF SURGERY, October, 1903, p. 575

<sup>2</sup> Studies in the Surgical Anatomy of the Small Intestine and its Mesentery ANNALS OF SURGERY, October, 1905, p. 543

NOTE—These experiments were performed at the Harvard Medical School the animal experiments in the Laboratory of Physiology, and the Laboratory of the Division of Surgery, the experiments on cadavers in the rooms belonging to the Department of Operative Surgery

I was not aware that this procedure had ever been used by any one else until just before I presented my paper at the meeting. At that

downwards A glance at Fig 1 will make clear this division of the small intestine into sections, the first section being between the first and second enterotomy wounds, and the second section between the second and third This diagram is intended only to illustrate the principle on which flushing may be done The number and position of the enterotomy wounds would naturally vary with the case \*

Now, in the human cadaver in order to cause the irrigating fluid to flow downwards in the bowel—and not upwards—it is necessary for the surgeon first to determine with certainty the *real direction* of the bowel in any loop of gut which he proposes to incise This can be determined with certainty, provided the abdominal wound is large enough to allow palpation of the mesenteric root For the purpose of explaining this method in detail I take the liberty of introducing Fig 2, which has already appeared in one of the articles already referred to. A loop of intestine is gently drawn out of the wound by the surgeon The assistant, grasping the two ends of this loop, holds it suspended vertically from the wound The surgeon, putting his thumb on one side of the loop and his fingers on the other, causes them gently to proceed down the mesentery towards the right side of the spine,—in other words, towards the root of the mesentery Fig 3 shows the narrow pathway in the deeper part of the mesentery down which his thumb and fingers must proceed in order to reach the mesenteric root If he finds a twist in the mesentery—a condition easy to detect—he withdraws his hand, and turns the loop of bowel in such a way that the twist is removed His thumb and fingers are then pushed again down the mesentery, in the same manner as before, towards the mesenteric root If there is then no twist in the mesentery the surgeon knows that the proximal end of

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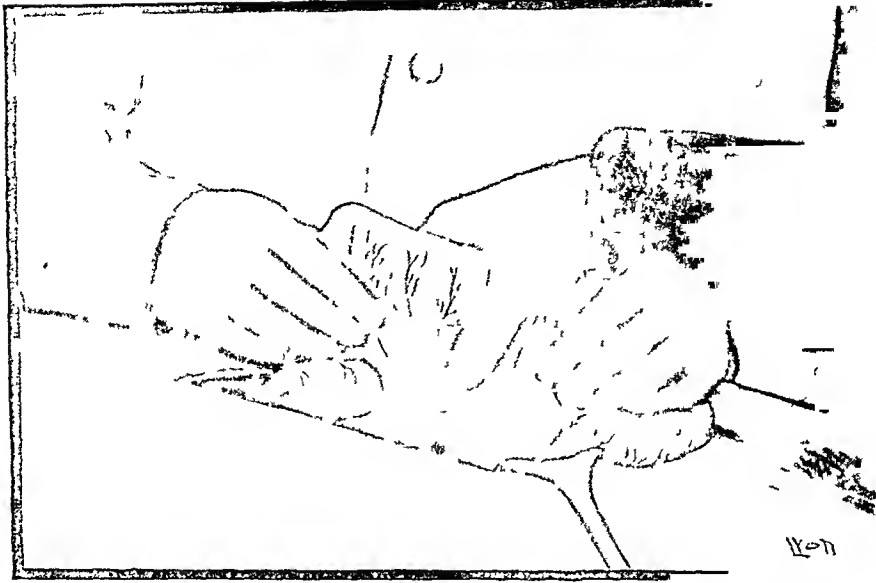
\* The systematic irrigation of the intestinal canal here suggested was planned for the purpose of experiments on cadavers and on animals, in which no pathological obstruction was supposed to exist It is, of course, obvious that no attempt should be made on a patient with mechanical obstruction to irrigate that part of the bowel in which obstruction exists, or, to do so even after the obstruction has been removed, if there is reason to believe that the wall of the gut has been weakened

FIG. 1



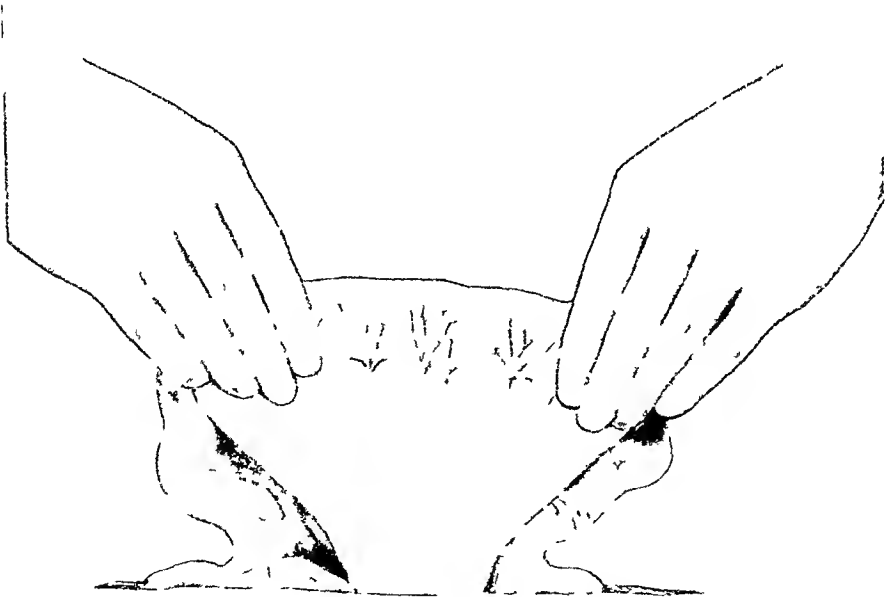
A diagram to illustrate a method by which the intestinal contents may be evacuated. In the diagram three enterotomy wounds are shown. The number and position of enterotomy wounds would naturally vary with the case.

FIG 2



Showing on the cadaver the method of determining the real direction of the gut by passing the thumb down one side of the mesentery and the fore and middle fingers down the other in the direction of the mesenteric root. If the whole of the cadaver were shown, its head would be on the left side of the illustration.

FIG 3



The loop of bowel is being held upwards by the assistant. The thumb and fingers would in this case proceed to the root of the mesentery down the constricted pathway in the middle probably without encountering any twist.

the loop lies at the upper end of the wound, and the distal end of the loop at the lower end of the wound. In this simple manner he learns what is the real direction of the gut, and, therefore, the direction in which the irrigating nozzle should be placed in the bowel. Simple as it is, however, it is hardly likely that one can successfully carry out this procedure on the living subject until one has tried it—in fact, practised it—on the cadaver.

With the idea of testing, so far as I could, the practicability of flushing the canal of the bowel, section by section, I carried out during the last two years at the Harvard Medical School a series of experiments on animals and human cadavers. In all of them I was assisted by Dr. William E. Faulkner, and it gives me pleasure here to acknowledge his kind and helpful services. I beg to thank also Professors W. T. Porter and W. B. Cannon for having placed at my disposal for a part of the animal experiments the necessary laboratory facilities.

### STUDIES ON ANIMALS<sup>3</sup>

I carried out the procedure referred to on fifteen cats. Although the technic of the operations on these animals varied somewhat, the essential features were approximately the same in all. The anæsthetic used was ether.

The hair upon the abdomen was removed by a depilator, and the skin cleansed and sterilized. The abdomen, having been freely laid open and the coils of intestine brought outside of the abdominal wound, the gut was incised on its free border at a point near the upper end of the jejunum. A small glass

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<sup>3</sup> My reason for beginning these experiments on animals rather than on human cadavers was principally because of the fact that the intestinal canal is much simpler and shorter in cats (the animals which I purposed to use) than in human beings, and I wished first to try the effect of this procedure (flushing the intestinal canal) under conditions which seemed most favorable before proceeding with what I knew would be (mechanically, at least) more difficult, namely, flushing the intestines of human cadavers. In connection with these experiments on cats I had also, of course, the great incidental advantage of observing the immediate and remote effects of the operation on living animals.



tube was then introduced through the enterotomy wound, and this tube, having been pushed well into the lower arm of the gut, was held or tied in position, after which the gut below the opening was gently filled with warm salt solution to a point just above the ileocæcal valve. At this point there was made another opening in the gut, and much of the salt solution which had already been injected into the gut through the upper opening was allowed, mixed as it was with intestinal contents to escape through the lower one. More salt solution was then introduced through the upper opening, and, of course, more wash water, mixed with intestinal contents, escaped from the lower opening, or through a glass tube which had been previously inserted into it. About one pint of salt solution was thus passed through the gut, the reservoir being held from 1 to 3 feet above the body of the animal. The length of intestine between these two openings was 3 to 5 feet, according to the length of the animal's bowel. The upper intestinal wound was then sewed up, and carefully cleansed, and all of the bowel which had been flushed, except that part in which the lower intestinal wound was situated, was returned to the abdominal cavity. In a few cases the lower intestinal wound was then sewed up, and the loop of bowel cleansed and returned to the abdomen. In the other cases—the most recent ones—the colon also was flushed from the lower intestinal wound through to the anus. This was accomplished by inserting the glass tube, directed downwards, into the lower enterotomy opening, and allowing warm salt solution gradually to flow into and distend the colon. After this an exit tube was inserted into the anus, and the bottle held a little higher. The result was that the wash water, mixed with fecal material, finally ran out through the anal tube. This washing was continued until the salt solution came away clear. The second enterotomy wound was then sewed up and the abdomen closed without drainage. Naturally, much of the fluid which had been injected into the bowels still remained there.

It is hardly necessary to say that in all of these cases the

greatest care was taken to avoid contamination of the peritoneum by the intestinal contents. During the manipulations those parts of the bowel in which were situated the enterotomy openings were drawn well towards the operator, and from the time when the first incision was made until the suturing was complete they were kept carefully isolated from the other parts, partly by gauze, but in the latter cases by means of superimposed sheets of rubber dam.

This method of using rubber dam proved so useful to me in these experiments that I give it here in detail. It seems to me not unlikely that it may be of practical value during operations on the human subject, in fact I have myself used it, with advantage, in a number of abdominal operations.

A piece of thin sheet rubber about one foot square,—on the human subject it should be 18 inches square,—properly sterilized, and moistened, with a small slit made at or near its centre, was laid over the laparotomy sheet in such position as to bring the slit in the rubber dam directly over the abdominal wound. The small intestines were then gently lifted out through the abdominal wound, and made to rest upon the rubber dam. Another sheet of rubber dam, also sterilized and moist, was then laid over them. Two little slits were then cut in this second rubber dam, and through them were gently drawn the two loops of intestine—naturally one belonged to the upper part of the gut and the other to its lower part—in which were to be made the two enterotomy openings. Though most of the intestinal coils were outside of the abdominal cavity, nevertheless, they lay between two sheets of rubber dam where they were kept moist and warm, and protected from injury and infection.

Of the fifteen cats operated on five died and ten lived. *Cat No. 1* died four weeks after the operation, but no definite cause for death could be found at the autopsy. The wounds in the intestine were solidly healed and there was no sign of peritonitis. *Cat No. 4* died eleven days after the operation. At the autopsy the upper wound in the intestines was found firmly healed. The lower wound, however, was in the middle

of a large suppurating area (*peritonitis*) in which several coils of intestine were included. The stitches in the enterotomy wound had evidently given way, for the wound was open, thus permitting the escape of intestinal contents into the peritoneal cavity. *Cat No 6* died three weeks and one day after the operation. The autopsy showed that the cause of death was *peritonitis*, and both wounds were open. It is likely that the *peritonitis* was due largely, if not wholly, to the fact that, intentionally, no attempt had been made in this case to approximate the serous surfaces of the bowel, the intestinal wounds having been united by a simple over-and-over suture. The method was used here for the reason that it had been successfully tried in the preceding case. The two other fatal cases were *Cats No 10* and *No 12*. Both of these animals died during operation—presumably from ether. Of the five cats, then, which died, the cause of death in two was presumably etherization, in one it was not discovered, while in the other two it was *peritonitis* resulting probably from technical errors, which had no necessary connection with the principle under investigation. None of the three cats which survived the operation was at any time after it in good condition. All three were evidently very sick, and from the time of the operation they took little or nothing in the way of food.

On the other hand, the ten cats which survived seemed to regain their former condition of health and activity within one to three days after operation, and they ate their usual amount of food.

Autopsies were done on these ten cats at the following times after operation: at 6 days (2 cats), at 8 days (1 cat), at 13 days (1 cat), at 18 days (1 cat), at 21 days (1 cat), at 26 days (1 cat), at 32 days (1 cat), at 33 days (1 cat), and at 35 days (1 cat). The animals were killed by etherization or by the use of gas, before these examinations were made.

Barring the fact that in a few cases the abdominal wound did not heal by first intention throughout, nothing pathological

was discovered at any of these autopsies, and the condition of the abdominal contents was quite normal except for the presence of the firmly healed intestinal wounds, and a few adhesions. The intestinal sutures (iron-dyed silk), partly disintegrated, were in some of the cases in the process of being thrown off from the wounds into the lumen of the gut.

From these experiments one is, I think, justified in stating (1) that it is mechanically possible, from an abdominal wound in a cat, to flush with salt solution the greater part of the small intestine through an opening in the upper part of the jejunum, to a second opening in the lower part of the ileum, and then to flush the large intestine from this second opening, the intestinal contents and wash water escaping through a tube previously inserted through the anus into the rectum, (2) that it is possible to do this in the majority of cases, if not in all of them, without causing sufficient shock to kill the animal, (3) that it is possible to do this without peritonitis resulting, provided, of course, that the operative technic is without error, (4) and, that it is probable the animal will regain, in the usual time after an abdominal operation, its former condition of health and activity.

#### STUDIES ON CADAVERS

I next tried to flush the intestinal canal of human cadavers with the same technic I had used in the cats, but I soon found, as I had expected, that the problem in the human body is a much more complicated one. While in a cat the small intestine is short, of small calibre, thick-walled, and comparatively simple in the disposition of its coils, that of the human being is very long, of large calibre, thin-walled, and very complicated in its arrangement.

With the abdomen of the cadaver wide open I attempted to flush the intestines, by sections, from the upper part of the jejunum down. On the whole, this attempt was successful, though I found that, in order to do it satisfactorily, more openings in the intestine were required than were necessary in the animal experiments. The great length of the intestine,

the complicated arrangement of its coils, and the occasional presence of masses of solid or semisolid feces in the colon presented obstacles to the onward flow of the water, though a gentle manipulation of the distended coils usually sufficed to remove the obstruction, and to allow the fluid to proceed down the intestinal canal. The technic was essentially as follows.

The abdomen having been freely laid open from ensiform cartilage to pubes, the presenting intestinal loops were lifted out of the abdominal cavity, and an incision was made into the jejunum as high up as possible. A large glass tube was tied into the opening thus made, and water, gradually introduced through the tube, was allowed fully to distend as much of the intestine below the opening as possible. After this the intestine was opened lower down and another tube—this one for exit—was tied in place. The portion of intestine to be cleaned was isolated from the rest of the bowel either by clamps, or by the ligatures used for holding the tube in place, or by hand pressure. The fluid which entered the intestine through the upper tube, coursed down the intestinal canal, and came out through the lower tube, carrying with it most of the intestinal contents. When the wash water was clear, the upper tube was removed, and the intestinal wound sewed up. The second segment of intestine was then flushed in the same way as the first one, the exit tube for the first segment of bowel being replaced, and used for the *flushing tube* of the second.

This process of irrigating the small intestine, section by section, and sewing up the enterotomy wounds when they were no longer needed, was continued until nearly the whole of the small intestine had been flushed, and its contents largely removed. It was necessary to make at least three openings in the gut—sometimes four or five—in order to wash out the gut in its whole length. From the lowest enterotomy opening the attempt was then made to flush the rest of the small intestine and the colon. As a rule this was successful, though, as I have already said, the presence in the colon of solid or semisolid feces sometimes made this process difficult. Finally the

last enterotomy opening was sewed up, and the abdomen closed

In order to determine whether a change of posture would make any difference with the ease with which the intestines could be washed out, I tried several of these washing experiments, with the cadaver in different positions. While the distended loops of an inverted cadaver—the intestines hanging from the open abdominal wound—could be washed out rather more easily than those of a cadaver lying on its back, the difference was not especially marked. The other positions tried, viz. elevated head, elevated feet, one side or the other uppermost, etc., showed no appreciable difference in the ease of flushing the bowel.

As a result of these, and many other similar experiments in flushing the intestinal canal of human cadavers I reached the following conclusions

- 1 That it is possible in most cadavers to flush the entire intestinal canal, *by sections*, from the upper part of the jejunum through to the anus, provided that the abdomen is freely laid open from ensiform cartilage to pubes, and also provided that, as already explained, there are made in the intestine a sufficient number of openings

- 2 That it is possible in most cadavers, through an incision from umbilicus to pubes, to flush either the lower part of the small intestine only, or the lower part of the small intestine, and the colon in addition

After I had conducted a number of these experiments on animals and cadavers it seemed to me that gently to flush the intestinal canal of a patient suffering with acute intestinal toxæmia, was a practicable procedure, and that, after the simpler methods had been used without result, it was a thoroughly justifiable one. It also seemed obvious that, after the escape of intestinal contents which would naturally take place through the enterotomy wounds—especially when a long evacuating tube is used,—a careful washing of the intestinal canal with warm salt solution would be of great advantage to such a patient, especially for the following reasons. First,

because it would cleanse a region which was the source of poisonous infection, secondly, because it would leave within the intestinal canal a large quantity of salt solution where it would be absorbed into the circulation, and thus improve the pulse, thirdly, because the warmth of the solution left in the bowel would probably help to resist shock. For these reasons I felt willing to carry out this procedure on a patient, provided the conditions which the patient presented seemed to me to justify it.

#### CASE

Finally a case, for which the treatment outlined above, or some modification of it, seemed especially suitable, entered my service at the Boston City Hospital. This case has already been published in full,<sup>4</sup> but as some reference to it seems to be called for in connection with the experiments which led up to it, I give here a brief abstract.

The patient was a little girl eight years old, whose condition (the result of streptococcus peritonitis and probably also intestinal toxæmia) was deplorable. The case was one of a class that surgeons dread to see. She presented the symptoms of an extreme degree of septicæmia, or toxæmia, and a fatal result within a few hours seemed inevitable. A median incision from umbilicus to pubes opened the abdominal cavity. There was free pus everywhere, and to the reddened intestines many thick yellowish flakes of fibrin were adherent. Exploration showed no obvious cause of peritonitis, though, as the appendix was somewhat swollen and injected, it was removed. The peritoneal cavity was thoroughly irrigated through a glass tube. A loop of intestine near the upper end of the wound<sup>5</sup> was drawn out and the real direction of the intestine comprising it determined.

An incision was then made in this loop, and a long glass tube, with its tip directed downwards, was introduced into the bowel through the intestinal wound. During this process much

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<sup>4</sup> Boston Medical and Surgical Journal, June 20, 1907, p. 809.

<sup>5</sup> By an oversight in the original report of this case the impression was given that this loop was near the duodenum, whereas it was, in truth, probably in the lower half of the intestine.

gas and a small amount of intestinal contents were removed. A gauze pad held by the hand firmly around the intestine kept the tube in place and prevented leakage. Warm salt solution was then allowed gradually to flow into and distend the intestinal canal, and a second enterotomy opening was made in the lowest intestinal loop which presented in the wound. Much foul-smelling gas and intestinal contents escaped from this second opening, but finally the wash water came out clear. The upper wound was then stitched up, and the tube was inserted into the lower wound, with its tip directed downwards. A large amount of salt solution was introduced which fully distended the rest of the small intestine and colon, and the lower wound was then stitched up. The peritoneal cavity was again irrigated, a small drain placed in the pelvis, and the abdomen closed. The greatest care was taken during the operation to avoid contamination of the peritoneum. After the dressing had been placed on the wound a rectal tube was introduced, and nearly a quart and a half of fluid, containing much fecal material, removed through it.

The change in the patient's pulse during the operation was so marked as to call for special mention. While before the operation it was "thready" and registered 180 beats to the minute, it became much stronger during the flushing of the intestine and dropped to 140. The patient's general condition was correspondingly improved. On being put back to bed, she soon rallied from the effects of the operation, and finally got well.

#### REMARKS

As a result of the experiments described, and also because of the recovery of the patient in the case just referred to, I am strongly inclined to the belief that the procedure has in certain cases, a distinct sphere of usefulness.

It seems to me that when a patient's life is in danger because of acute intestinal poisoning, associated with great distention of the bowels, and the time has passed when the ordinary methods seem likely to be of use, when the temperature is high and the pulse rapid and weak, there is in such a case a fair possibility that the immediate removal through enterotomy openings of a part of the intestinal contents, and flushing the gut with a quantity of warm salt solution, from



one opening to another, may, at this critical period in his illness, turn the scale in favor of the patient, and thus save his life. I have suggested carrying out this procedure through multiple openings in the intestine for the reason that, in my opinion, it can be done more thoroughly in this manner. It is, of course, possible that even if done through only one opening the procedure may still be sufficient to be of material assistance to the patient. Apparently, the coexistence of peritonitis does not contraindicate the procedure.

It is quite possible that for various reasons the technic of this procedure is easier in a child than in an adult. However, I see no reason to prevent its performance in the adult, at least in part, provided great care is taken. Care must also be taken, as already mentioned, in cases in which there is, or has been, a mechanical obstruction of the bowel, or in which for any cause its walls are greatly weakened.

As for the technic of the procedure of flushing the intestinal canal I venture to make the following suggestions:

1. Make a free opening through the abdominal wall in the median line, the incision reaching from the pubes to, or above, the umbilicus.
2. Pick up a loop of bowel high up in the wound.
3. Determine by reference to the root of the mesentery which is really the upper and which the lower end of this loop. This determination is essential, if one wishes to know in which direction the salt solution will flow during the process of flushing.
4. Make an enterotomy wound in the loop. Allow gas and feces to escape, and insert the tube into that arm of the loop which leads in the direction of the ileocecal valve. In other words insert the tube pointed downwards into the gut.
5. Allow warm salt solution gradually to distend a few of the loops below this opening. If nothing more than this is done in the way of washing, it seems to me that the substitution in the bowel of the warm salt solution in place of the gas and feces that have escaped, will presumably help the patient.
6. If the patient's condition will allow it, pick up the

loop which is apparently the lowest of those distended, make a second opening, insert a second tube—this one directed upwards—and allow the wash water to run out through the tube until it becomes clear.

7 Carefully cleanse and sew up the first enterotomy wound, and return to the abdomen that part of the bowel which has been washed out. In fact, as soon as any enterotomy wound is no longer needed it should be cleansed, and sewed up, and the loop of bowel which has been sutured should be returned to the abdominal cavity.

8 Repeat this procedure as many times, consistent with safety, as may seem necessary, each time isolating and cleansing a segment of intestine lower down.

9 Finally, if the patient's condition will permit further operating, fill the colon with salt solution from the lowest enterotomy opening, and insert a rectal tube to remove any wash water or intestinal contents which may reach the rectum. It is well to insert the rectal tube before attempting to close the abdominal wound, and thus make it easier, by removing some of the wash water in the colon, and diminishing its size, to bring together the edges of the wound.

10 Use great gentleness in all manipulations, and carefully avoid contamination of the peritoneum. The method already described of protecting the intestines between two layers of rubber dam bids fair to be of real service.

11 In the event that peritonitis is also present, the peritoneal cavity should be washed out thoroughly, *before* flushing the intestinal canal, and also *after* it.

In closing, I wish to repeat that I do not consider flushing the intestinal canal to be a substitute, in all cases, for tubage of the intestine, or even for ordinary enterostomy. Flushing would seem to be called for only in the most desperate cases—fortunately occurring less frequently, as time goes on—in which the bowels are greatly distended, and in which the patient, overwhelmed as he is with septic or toxic products, will die unless immediate relief is afforded.

# PRIMARY CARCINOMA AND SARCOMA OF THE APPENDIX VERMIFORMIS \*

BY RICHARD H HARTE, M D ,

OF PHILADELPHIA,

Surgeon to the Pennsylvania Hospital

PRIMARY carcinoma of the appendix has been a subject which has interested both surgeons and pathologists for many years. A great deal of work has been done on this subject both by pathologists and surgeons, although it has been regarded by many as a very rare condition and by some, rather as a surgical curiosity. In looking over the literature, we find that the first case where malignancy of the appendix was recognized was by Merling<sup>39</sup> as far back as 1838. Since that time many cases have been collected, and in analyzing these cases we find that many of those reported are very imperfectly described and cannot be put down as primary cases of carcinoma involving the appendix, as many of them have their origin in the cæcum or else are the result of metastasis from other portions of the infected abdominal viscera. It is interesting to note that in a majority of the cases analyzed we find that most of them are reported by American authors. The great majority of these cases had some acute or chronic inflammatory lesion which was responsible for the symptoms demanding operation. Some few of them were found, however, in autopsies as the result of routine examination of the appendix.

As to the frequency of malignant disease of the appendix, nobody can deny that this condition is becoming more frequently recognized as the result of more systematic and careful examination of all appendices removed, as is shown by the number of cases collected and reported from the Bender Laboratory in Albany. There is little doubt that many cases of malignancy were overlooked, in which it was sup-

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\* Read before the American Surgical Association, May 5, 1908

posed that a macroscopical examination was all that was necessary to demonstrate whether an appendix was slightly inflamed, or whether it was the seat of a neoplasm

In response to a letter which was sent to the Fellows of this Association, asking for a report of cases of malignant disease of the appendix occurring in their practices, a large number of answers were received, many of the Fellows stating that they had had no experience with this condition. In some of the cases received the diagnosis was not entirely borne out by microscopical examination, and we were therefore forced to exclude them from our list. We were successful, however, in collecting 9 cases which had not been previously reported. In 1902 the author reported two cases at the Albany Meeting of this Association, in which the diagnosis was verified by a thorough microscopical examination. One of these cases is in perfect health to-day, but the other patient has been lost sight of. Since that time three other cases have occurred in our practice, in two of them the condition was found as the result of routine operation for appendicitis, in the other, a patient of Dr Meigs, a neoplasm was found at autopsy, the patient having died of lobar pneumonia at the Pennsylvania Hospital.

We have collected from various sources 92 cases of primary carcinoma of the appendix, to this number may be added 9 cases collected by the author, the most of which have occurred in the practices of the Fellows of this Association. It will, therefore, very readily be seen that the condition ceases to be a rarity.

Zaaijer<sup>64</sup> mentions that 18 cases of carcinoma were collected from a total of 2322 autopsies for appendicitis, we think it probable, however, that this number is too small, as in many of these 2322 cases the appendices were not examined microscopically. If this procedure is not carefully carried out many cases will be lost. In one of our own cases the detection of malignancy was recognized only after several sections had been cut through different portions of the appendix.

Baldauf<sup>1</sup> states that about 1 per cent of all inflamed appendices removed will be found to be malignant to a more or less degree. This malignancy depends for its severity in

a great measure upon the time of life in which it is detected For instance, carcinomas of the so-called basal celled variety, as described by Warthin,<sup>59</sup> arising in young subjects, seem to be much less malignant Baldauf's percentage appears large when compared with the results of older observers, but this difference is attributed by some to the more accurate methods of examination now being employed Kelly<sup>28</sup> explains it by the fact that carcinoma of the appendix often causes perforation or gangrenous inflammation in its early stages But there appears to be another factor at work — If appendicitis is the cause of appendiceal carcinoma, an increase in the former will cause an increase in the latter, and vice versa An increase in the frequency of carcinoma of the appendix will be an important argument in favor of assuming an increase in appendicitis

The question of carcinoma of the appendix must be investigated from both an anatomical and a clinical side We find that in nearly all the collected cases the operation was performed for the relief of symptoms of appendicitis of either an acute or chronic variety The condition of the appendix was found on careful microscopical examination In many instances the inflammation had lasted for a period of years and in some instances it would seem that the inflammation antedated the cancer A point worthy of attention is that few cases of carcinoma of the appendix have occurred where there was an acute inflammation, but when this has occurred it has in all probability been an acute attack grafted on an old case of chronic inflammation of the appendix That chronic inflammation plays a very important part in carcinoma of the appendix is shown by the fact that a large percentage of the tumors were found in the tip of the appendix which had previously been obliterated by chronic inflammation Some tumors were detected throughout the organ, and a few were found in a totally obliterated appendix

These facts therefore go far to prove that this neoplasm has a strong predilection for developing in the seat of a previously chronically inflamed appendix

The age of the patient in which we find appendiceal

carcinoma is of no little interest If we tabulate those cases in our list we have

Under 10 years of age	4
From 10 to 20 years of age	13
" 20 " 30 " " "	34
" 30 " 40 " " "	21
" 40 " 50 " " "	7
" 50 " 60 " " "	4
" 60 " 70 " " "	2
" 70 " 80 " " "	2
" 80 " 90 " " "	1
Age not stated	4
	<hr/>
Total	92

(Average age of all cases was 29 years )

Of this number 41 were males, 59 were females, and in 9 the sex was not stated Age not mentioned in 4 cases, of which 2 were males, and 1 was a female

We have also been able to collect 6 cases of sarcoma of the appendix, of which 4 were males and 2 females The respective ages of these patients were 45, 39, 27, 55, and in 2 cases the age was not stated

The question may naturally arise, why does the age of malignancy in the appendix differ so greatly from the age at which malignant disease is found in other organs of the body but this can be answered by the fact that a large percentage of all carcinomatous appendices are found as a result of operations for appendicitis, and most operations of this character are done between the ages of ten and forty years Therefore, the above deduction cannot be said to be true, but is simply applicable to the usual age at which operations for appendicitis are performed

The tumors, although almost always very small, vary greatly in size,—from microscopical size to the size of a normal ovary As we know little about the early stages of intestinal cancers, it may be that similar cancers can be found in other parts of the intestine in young individuals, if so they are usually overlooked at autopsies, and we might therefore say that very small cancers of the appendix make their appearance

from ten to thirty years earlier than the large evident intestinal tumors presenting clinical symptoms

The appendiceal tumors will give rise to symptoms apart from those accompanying appendicitis only when the growth has extended to the surrounding tissues, invading the cæcum and becoming a carcinoma of this organ, for by this time the appendix has lost nearly all its characteristics and is hardly recognizable as the primary seat of the growth. We are of the opinion that these cæcal cancers originating in the appendix are apt to occur later in life, usually between 40 and 60 years, and have a marked tendency to metastasis and recurrence. Many writers concede the appendiceal origin of cæcal cancers, believing them to spring from some cancer-nest in an old, chronically inflamed appendix, after the patient has reached the age of 40 to 60 years. So obscure is this subject that light can be thrown upon it only by the fundamental revision of cæcal carcinomas, and by the careful study of all future cases.

Our experience with recurrence of the disease in the cæcum after removal of the appendix for carcinoma has been very limited, but there is no doubt that in a certain number of cases the condition does recur in the cæcum.

It would seem probable that the cases of primary malignancy of the appendix so far reported fall into two classes—first, the columnar-cell type, as found in the stomach, intestine, and other parts of the alimentary tract, and second, the spheroidal-cell type which closely resembles the basal-cell carcinoma of the skin. In this latter class Rolleston and Jones<sup>52</sup> would place the great majority of primary cases of appendiceal carcinoma, and we think it probable that many cases described as endothelioma and sarcoma are in reality this type of carcinoma. Warthin is of the opinion that the vast majority of reported cases of malignant tumors of the appendix are to be classed as basal-cell carcinomas. This theory would seem also to be borne out by the age incident: the average age of 14 cases described as spheroidal-cell carcinomas was 24 years, while the average age of the cases described as columnar-cell carcinomas was about 50 years, which more nearly corresponds

to the average age at which primary carcinoma of the intestine occurs. We may therefore consider that basal-cell carcinoma of the appendix is a disease occurring in early adult life, the earliest observed case being about 7 years of age, reported by Oberndorfer<sup>45</sup> The basal-cell type is characterized by its relatively slight malignancy, and it does not tend to set up metastases or to recur after operation. In cases of columnar-cell type the prognosis is not favorable. This fact is only another evidence of the importance of basing the ultimate diagnosis and prognosis upon the precise histological study of the neoplasm.

Rolleston and Jones in a number of cases removed the appendix during life, but the nature of the disease had not been suspected in any case prior to operation. In three of their cases a portion of the cæcum at the base of the appendix was removed, and in two cases a more radical operation was necessary. Recovery is definitely stated to have occurred in the majority of the cases.

Zaaijer<sup>64</sup> believes that the difference in the age at which the principal types of carcinoma occur in the appendix is so small that one cannot say that any one type of carcinoma is more apt to occur at any stated age than is another type, but we think an exception may be taken to this statement in the occurrence of the so-called basal-cell type, which, as has already been stated, has been found most frequently in young subjects.

The principal mass of the tumor is generally to be found located in the mucosa and the submucosa and in the central connective tissues which replace these layers in obliterative appendicitis.

After a careful consideration of the collected cases we agree with Ribbert's<sup>49</sup> theory regarding the histogenesis of carcinoma of the appendix, *e g.*, that the tumors develop from epithelial nests which have been loosened from their attachments and which find the chief cause of their detachment in the chronic connective tissue inflammation. It is difficult to determine the starting point of many of these small tumors, but it would appear that the disease starts in the mucosa, which



becomes replaced by spheroidal-cell growths from the Lieberkuhn crypts

After having considered in a measure some of the clinical and pathological signs of cancer of the appendix are we able to build any hypothesis which will assist us in making a positive diagnosis of cancer of the appendix via other than the classical signs of appendicitis, such as pain, with which it is so closely associated? Let us, therefore, consider the classical signs of appendicitis, namely, pain, tenderness, presence or absence of a mass, rigidity, temperature, pulse, blood, history of previous attacks, age, sex and the question of heredity

*Pain* in the region of the appendix is so common in all intraperitoneal irregularities that no dependence can be placed upon this symptom beyond indicating an inflamed appendix

*Tenderness* and pain go hand in hand so often in all forms of appendicitis that it is of little diagnostic value

The *presence of a mass* can be determined only if the disease has invaded the cæcum, and often from this sign, in the absence of any acute inflammatory action, the diagnosis of malignancy can be made. In one of my cases however the appendiceal tumor was as large as an ovary, and yet nothing could be palpated, simply because the neoplasm was floating loosely, attached to a long appendix and meso-appendix. The author feels very skeptical with regard to the asserted ability of some surgeons to palpate appendices which on opening the abdomen were only located after a long and diligent search.

*Rigidity* will be noticed only in proportion to the amount of pain that is experienced or irritation caused, especially when the abdomen is palpated, and this rigidity is simply an attempt on the part of the muscles to protect the inflamed and irritated appendix from injury. It is always seen where there is any intraperitoneal irritation, arising from any source.

*Temperature* —It is questionable if any deductions other than an inflammatory condition, can be drawn from this symptom. Moschcowitz mentions a curious temperature rise in one of his cases, but this appeared to be dependent upon some autointoxication entirely foreign to the appendix.

*Pulse*—It would be impossible to expect to draw any deductions from this source beyond a distinct rise in the temperature or an acute inflammatory condition

*Blood*—If the disease in question has advanced and is causing much local irritation, a distinct leucocytosis might be expected. On the other hand, in microscopical cases I question if any data can be gathered from the most elaborate study of the blood picture.

The *history of previous attacks* is important, bearing considerable relation to both the symptoms and the prognosis. It appears that nearly, if not all, cases of cancer of the appendix have been ushered in by attacks which were supposed to have been appendiceal, but it is only after the removal of the appendix that the exact condition reveals itself. It generally shows that the carcinoma has selected for its site a previously chronically inflamed appendix. This view has been strengthened by the observations of Letulle and Weinberg and was undoubtedly true in the four cases upon which the author has operated. Patients are apt to be so inaccurate in their statements with regard to former attacks of appendicitis, confusing the symptoms with those of cold, indigestion or slight abdominal cramp, that deductions placed upon such information are of practically no value. Moschcowitz, in analyzing a number of cases, states that 66 per cent of carcinomas were preceded by acute inflammatory symptoms. The symptoms in some few cases may be caused by a small neoplasm impinging on the lumen of the appendix, causing a stenosis which will cause symptoms of appendicitis. I am strongly of the opinion that in the appendix, as in other portions of the body, malignancy tends to develop in previously chronically inflamed and irritated areas, and consider this a strong argument for the removal of all offending or troublesome appendices.

The question of the *age of the patient* has already been spoken of at some length. Most of the collected casts of carcinoma of the appendix have been procured from operative statistics, the operations being, as a rule, performed on patients between the ages of five and forty years. The natural conclusion, therefore, would be that carcinoma develops in

appendices most frequently at the time of life in which the acute inflammation of the appendix is most common, but this is simply because the condition is disclosed at operation

The sex of the patient noted in the appended table was given in 100 instances, of these 41 were males and 59 females. The anatomical relations in both sexes are identical, with the exception of an occasional appendiculo-ovarian ligament. Nevertheless, the greater frequency of the condition in the female is worthy of note.

In cancerous diseases *heredity* is a factor which must not be lost sight of, especially where the examination of a patient who has passed into the cancer zone is concerned. The author's last patient operated upon was 41 years of age, and at the time of his operation his mother was suffering from an advanced scirrhus of the breast, from which she subsequently died.

After carefully considering the various signs, symptoms, and pathological data relative to primary cancer of the appendix, we arrive at the following conclusions:

1 Primary carcinoma of the appendix is present in from  $\frac{1}{3}$  of 1 per cent to 1 per cent of all cases operated upon for chronic appendicitis. But few cases are collected at autopsy.

2 Institutions which make a thorough microscopical examination of all appendices removed at operation and at autopsy will report a larger percentage of cases of carcinoma of the appendix.

3 Carcinoma of the appendix, especially of the basal- or spheroidal-cell type, is a condition of early life, occurring generally between the age of 10 and 40. There is little tendency to metastasis and the origin of the disease is, as a rule, in the mucosa.

4 The disease appears to be slightly more frequent in females than in males.

5 Acute and chronic inflammations are present and are responsible for the symptoms demanding operation. The growth, while localized, gives no pathognomonic symptoms.

6 The fact that primary carcinoma of the appendix

takes its origin in an inflammatory process forms a very strong argument for the removal of all appendices which show evidence of any irritation

The histories of the unreported cases which the author has been able to collect are as follows

CASE I—G, man, aged 30 Carcinoma of the appendix was discovered at autopsy after death from lobar pneumonia Patient of Dr Arthur V Meigs at the Pennsylvania Hospital Admitted 1-21-'04 Died 1-23-'04 Family history negative Had rheumatic fever at thirteen and has had quinsy several times and pleurodynia once Caught cold on the 17th ult and developed typical attack of pneumonia Physical examination on admission, negative except as to pulmonary condition Patient was wildly delirious before death Temperature averaged 104° F There were no symptoms pointing toward the appendiceal condition

Autopsy No 513 Ayer Clinical Laboratory—Anatomical diagnosis Acute lobar pneumonia, double acute fibrinopurulent pleurisy, fibrinopurulent pericarditis, congestion and œdema of the lungs, acute splenic tumor, cloudy swelling of kidneys and liver, primary adenocarcinoma of appendix There were no evidences of metastasis The appendix measures six cm in length and lies behind the cæcum pointing downwards There are no adhesions The appendix ends in a bulbous, whitish tip which curls around much as a snail shell and is slightly adherent to itself at the distal part only This bulbous end measures about two cm in diameter The thickening and enlargement occurs very suddenly, and measures about five cm in length The curled tip shows many injected vessels over its surface and a few minute, pinhead-sized nodules

On section through the curled tip, what represents the lumen appears as a solid, round, regular, well-defined mass, seven mm in diameter It is streaked yellow and gray and bulges considerably

Microscopical Examination—Sections through the bulbous tip The entire central portion of the appendix is filled with an adenomatous growth The gland spaces are separated by delicate connective tissue trabeculae Some of the spaces are lined by one or several layers of columnar or cuboidal epithelium, usually separated from the wall Others are almost filled with loose epithelial cells Surrounding this are the muscular tissues, which are infiltrated with narrow strands and groups of cells like those in the mucosa

CASE II—Personal communication from DR C H MONKS—X Y, age 24, a strong well-built woman, who had previously been troubled more or less with indigestion for an indefinite period, entered the Boston City Hospital in September, 1902.

with symptoms of appendicitis, from which she had suffered for two days This illness began with pain which was more or less general over the abdomen, later becoming limited to the lower half No vomiting, and bowels were easily controlled with enemata The general condition of the patient on admission was good and pain was not severe Temperature, 100.5, pulse, 100 No spasm of abdominal muscles, moderate tenderness in region just below and to the right of umbilicus and also in corresponding region in left side The diagnosis of chronic appendicitis was made and the appendix was removed a few days later and externally presented the appearance of chronic inflammation

**Pathological Examination** Appendix 5 cm long Mesentery adherent with some fat Surface reddened Small dilated blood vessels easily seen Mucous membrane grayish and gelatinous Yellowish nodule 0.6 cm in diameter found 1.5 cm from distal end

**Microscopical Examination** Slight infiltration of muscularis under submucosa with lymphoid cells At site of tumor the mucosa is entirely replaced by a mass composed of connective tissue surrounding collections of epithelial cells

**Diagnosis** Adenocarcinoma, chronic appendicitis

The patient made an uneventful recovery from the operation and was discharged twenty-four days later

Five and one half years after the operation the patient was thoroughly examined and no evidence whatever of recurrence was seen and she was enjoying the best of health

**CASE III**—Personal communication from Dr JOHN C MUNRO—J F F, aged 47, Irish laborer Admitted April 3, 1906 Discharged April 30, 1906 Family history negative Previous history Two weeks before operation he had an acute attack of general abdominal pain localizing in appendiceal region and accompanied by nausea and vomiting Pain and tenderness subsided gradually in three days, but there has been an exacerbation of these symptoms about every other day since attack began Lost seven pounds and had no appetite

**Physical examination** Well-developed and nourished, has non-movable mass the size of tennis ball in right iliac region, there is tenderness but no spasm

**Operation** Operation by Dr Bottomley April 4 Rectus incision, rather higher than usual, over mass Very hard irregular mass to outer side of cæcum to which it was slightly adherent

Appendix removed by peeling out mucous and submucous coats. That the tumor was malignant was not realized until the pathological report was received a few days later. Cigarette drain placed and wound partly closed as there was some oozing. There was a purulent discharge for a few days, but recovery was uneventful.

Microscopical examination of the appendix shows it to be infiltrated with carcinoma of a cylindrical-cell type.

A secondary operation was urged as soon as the nature of the lesion was known but patient refused. Patient was examined March, 1908, and no evidence of metastasis could be found. Patient seemed in perfect health.

CASE IV — Personal communication from DR. A. T. CABOT — Miss P., aged thirty years. Operation, 1907. Had symptoms referable to appendix, and operation for removal showed appendix to be twisted.

**Microscopical Examination.** The specimen consists of a very much curled up appendix, bound down by adhesions. The epithelium of the glands of the mucosa has undergone a very curious atypical growth which in places presents the histological picture of a carcinoma but lacks the infiltrating character of such a growth. There is a large amount of chronic inflammatory tissue present.

This operation was not followed by as complete a recovery to comfort as was to have been expected, and when this condition described by Dr. Wright was known I remembered that I felt a little nodule down, seemingly, on the wall of the pelvis, which at the appendix operation I could not bring into view, and which I thought was simply a little fibroid. On January 14, 1898, I again operated. At that time the patient was in better weight, and had been having better digestion, looked distinctly better than when I had seen her in May. Examination under ether showed the right ovary fixed on the side of the pelvis and enlarged, although not greatly so. Upon opening the abdomen I found the ovary as it had been felt by examination, and close above it was a little hard mass which was situated in the side of the Fallopian tube. The ovary and the whole Fallopian tube were ligated and cut away. The other ovary seemed in good condition, and the uterus was in good position, so that it was not fixed by suspension. The Fallopian tube presented a pea-sized nodule in its wall. This nodule is due to the presence of carcinomatous tissue in the wall of the tube as demonstrated by

microscopical examination The patient was heard from in 1907, when she still had considerable pelvic distress, and a second operation for removal of other ovary, etc At this time the organ removed showed no sign of carcinoma

A re-examination of the sections of the appendix by Dr J H Wright in the case of Miss P convinced him that the condition in the organ is carcinoma The carcinomatous tissue consists of large and small columns and masses of atypical epithelium-like cells imbedded in a variable amount of connective-tissue stroma The cells are generally smaller than the general run of carcinoma cells and do not form tubules as is commonly the case in cancers of the intestine In a few places there are appearances suggesting the origin of the carcinoma cell masses from the dilated tubules of the mucosa The tumor tissue does not appear to infiltrate the outer layers of the muscular coat of the appendix

A re-examination of the sections from the Fallopian tube reported under the date of January 15, 1898, shows a carcinoma in the wall of the tube There is no involvement of the mucous membrane The carcinoma shows, generally, narrow columns of epithelial-like cells imbedded in a moderate amount of stroma The cells in general are larger than the cells of the carcinoma of the appendix There is nothing, however, inconsistent with the idea that this carcinoma of the Fallopian tube may be a metastasis from the carcinoma of the appendix

CASE V—Personal communication from DR A VANDER VEER—Report from the Bender Laboratory of the Albany Hospital Miss M A, aged fourteen Clinical diagnosis acute appendicitis Operation by Dr Sibley

Specimen consists of a swollen and previously sectioned appendix measuring 65 cm in length The external surface is covered in places by an exudate of rather adherent, yellowish-white material All coats are thickened Mucosa presents numerous punctate hemorrhages and is ulcerated in patches Two cm from the proximal end there is a slight thickening of the tissues, particularly of the mucosa Anatomical Diagnosis Acute diffuse and ulcerative appendicitis Acute fibrinopurulent periappendicitis

Microscopical Description On section all coats are thickened and infiltrated by polynuclear leucocytes Exudation of lymph on peritoneal surface Mucosa ulcerated in patches Other sections show all coats to be invaded by irregularly branching and anastomosing columns of polyhedral cells

Microscopical Diagnosis Carcinoma simplex of appendix Acute diffuse and ulcerative appendicitis Acute fibrinopurulent periappendicitis Patient was in good health three years after operation

CASE VI—Personal communication from DR A VANDER VEER—Report from Bender Laboratory of the Albany Hospital

Miss W P, aged thirteen Clinical diagnosis appendicitis Operation by Dr Hacker

Specimen consists of a markedly thickened appendix, firmer than normal and measuring 4 cm in length The peritoneal surface is pinkish-red, has firm fibrous tags attached, and 1 cm from the tip, presents a small perforation which communicates with the lumen, the tissues about this opening are greenish-black The lumen is patent throughout The mucosa is pinkish-gray, shows numerous spots of ecchymosis and is everywhere thickened Accompanying the specimen is a strip of omentum 8 cm in length which shows at one end a fibrinopurulent exudate It is deep red and has fibrous tags attached

Anatomical Diagnosis Chronic appendicitis with acute exacerbation, gangrene and perforation

Microscopical Description Section shows the mucosa to be atrophied and in some places entirely absent The stroma about the gland follicles shows eosinophilic infiltration The lymph-follicles are enlarged and show young connective-tissue infiltration At one side of the section in the submucosa is an area containing but little connective-tissue stroma, showing numerous clefts filled with masses of large cells with deeply staining nuclei and having no definite arrangement

Microscopical Diagnosis Carcinoma of appendix, Chronic appendicitis with acute exacerbation and necrosis

CASE VII—Personal communication from Dr A VANDER VEER—Report from Bender Laboratory of the Albany Hospital Miss K B, aged twenty-one Clinical diagnosis was chronic appendicitis

Specimen consists of a previously sectioned appendix Distal two-thirds considerably thickened The peritoneal surface shows numerous dilated blood vessels and at the distal extremity firm red tags At the junction of the middle and proximal thirds the lumen is obliterated and the distal end is considerably thickened and filled with a greenish fecal mass The mucous membrane of the distal two-thirds is grayish-red, showing spots of hemorrhage The remainder of the mucosa is apparently normal

Microscopical Description Sections of appendix show mucous membrane diminished in amount and crowded together, the lumen being obliterated There is an increase of connective tissue in the submucosa and there are numerous newly formed blood vessels The muscular coat shows a moderate, small lymphocytic infiltration and the peritoneum is oedematous and has irregular tags of delicate, oedematous tissue interrupting its free surface In the submucosa there is a growth composed of areas of cells with large, deeply staining, vesicular nuclei separated by strands of connective tissue and arranged in alveolar form The connective tissue surrounding this new growth is deeply infiltrated with small round cells The new growth is more or less circumscribed and pushes aside a portion of the mucous membrane



Microscopical Diagnosis   Chronic obliterative appendicitis   Primary carcinoma of the appendix

CASE VIII   HARTE   Admitted to Pennsylvania Hospital 10-17-'07, discharged 11-7-'07   G P, man, age 41   Came to the hospital complaining of slight dull pain, soreness, and some tenderness in right iliac region for the past three months   Mother operated upon for carcinoma of the breast two months ago   History otherwise negative   Always robust and healthy except for appendiceal trouble and an attack of typhoid fever at fifteen   No venereal history

Present illness dates back about two years when he had abdominal pain and tenderness, vomited and was slightly constipated, was compelled to go to bed for a day or two   The following week had another attack and subsequently had slight attacks of abdominal pain and discomfort lasting two to three days, every month, for three or four years, attacks then decreased in frequency up to about four months ago, when they recurred with increased severity and pain and tenderness in right iliac fossa became more pronounced and he had some slight nausea and constipation   Appetite good   Condition remained about the same until his operation

Physical Examination   Well built man, heart, lungs and urine negative   Abdomen negative

Operation (Dr Harte)   Incision in right rectus   Mass four by eight cm in size found lying free in right iliac fossa and continuous with appendix   It was very much like a swollen testicle   Mass removed and appendiceal stump inverted in the usual manner   Incision closed in layers and supported with through and through silkworm gut sutures   Uninterrupted convalescence   Wound healed nicely

Pathological Examination   The specimen consists of a large, more or less egg-shaped cyst which measures approximately 6 or 7 cm in length and appears as large as a goose egg   The cyst has been opened but the contents are still adherent to the wall

It is a soft, sticky, jelly-like material, part of which is opaque and yellowish-green, parts seem translucent and dark yellow in color   Here and there are small masses of blood

Altogether the contents of the cyst measures at least 100 c c   The outside of the cyst is quite irregular in appearance   It is generally of a pinkish color and shows many injected vessels   Over all parts of the external surface there are irregular white thickened patches  $\frac{1}{2}$  to 2 cm in diameter, which are quite firm and definitely raised   The margins are

quite well outlined. Some of them extend down toward a line of fat which is taken to be the meso-appendix and which extends throughout the cyst along one surface. This meso-appendix is rather small.

At the proximal end of the cyst there is a narrow stump which looks like the appendix. This measures about  $\frac{1}{2}$  cm in length and a little over  $\frac{1}{2}$  cm in diameter. The wall of this small bit of appendix is continuous with the wall of the cyst, though the appendix begins very suddenly. The stump of the appendix as well as the cyst has been opened.

Only a few mm at the extreme proximal portion suggest in the least a normal appendix. Here the lumen seems to be lined with a soft mucous membrane. The area between this and the cyst is filled with a fairly firm, opaque, yellow material which apparently has occluded the appendix.

The incision which was made in the operating room continues through the mass, which was cut in two, and into the cyst. It can not be told, now, whether there was communication between the cavity of the cyst and the lumen of the proximal end of the appendix. The wall of the cyst, where the gelatinous material has been removed, appears very irregular and has a lumpy appearance. It is lined by what looks to be a thin yellowish parchment-like membrane. In places the yellow-like material is quite firmly attached to the wall.

When some of the nodules on the serous surface are cut into they seem to be of an opaque, firm, yellow material.

Sections through the proximal end of the appendix show the following appearance. The subserous coat looks somewhat congested, thickened and contains fairly large accumulations of small round cells. The muscular walls are thick and the inner circular coat is two or three times the thickness of the outer longitudinal coat. Besides the thickening there is much degeneration in the muscular coats. The fibres are swollen, hyaline and separated by a great deal of loose connective tissue. In the submucosa, which is rather thin, there are localized accumulations of small round cells, often with centres composed of large pale cells. These are taken to be the remains of lymphoid follicles. There is an increase in the connective tissue in the submucosa. The normal mucosa is entirely lost. In its place there is a thin layer, of what appears to be hyaline fibres separated by a few connective tissue cells. On the surface of this hyaline material there are very curious cells. These are large irregular cells, sometimes elongated or goblet-shaped and projecting toward the lumen of the appendix. Many of them are filled with refractal granules. They are of a great variety of shapes and sizes. Many of them contain two nuclei, some appear as giant cells containing four to twenty nuclei or more. The nuclei are rather small, elongated and deeply staining. Covering these cells is a layer of hyaline looking material which contains cell remnants and red blood corpuscles, near the lining cells this material stains blue in hæmatoxylin, towards the centre it stains pink in eosin. This material corresponds to the jelly-like contents of the cyst. The small nodules between the proximal portion of the appendix and the neck of the cyst show in two sections different appearances.

In one section the nodule is composed of connective tissue infiltrated with small round cells, cells of epithelioid and plasma-cell type, and shows spaces, particularly near the surface, containing the hyaline material. Covering the surface of this nodule there is an irregular fringe of large cells described before. Great numbers of very large giant cells are seen and mixed with them are the elongated and columnal cells of epithelial type. This large cell gradually mixes with the blue-staining cyst contents.

Sections through another nodule show a definite carcinoma simplex. The cells are rather small, irregularly polygonal, have deeply staining nuclei and lie closely packed in spaces of various sizes. Some of the spaces are quite large but there are rarely degenerative changes in the centre. No definite karyokinetic figures are seen. The masses of cells infiltrate rather extensively the underlying muscular coats and in the nodules are separated by a moderate amount of connective tissue.

Sections through the wall of the cyst show much the same appearance as sections through the wall of the proximal part of the appendix.

The muscular coats are more irregular, sometimes being thick, sometimes thin and the accumulations of small round cells in the tissue above the muscular coats is more extensive and more diffuse. The lining membrane is practically the same and shows great numbers of giant cells. Sections through the hard masses in the cyst wall show them to be composed of old hyaline connective tissue.

Anatomical Diagnosis. Carcinoma of the appendix. Cyst-formation with mucinous contents.

CASE IX—HARTE—M. K., woman, age 39. Admitted 2-19-'03. Discharged 3-30-'03.

Previous History. Patient has been sick three days with severe pain and tenderness in right iliac region, bowels have not moved for four days, no vomiting and no fever. Has never had similar attack before but has had three attacks of gastritis.

On admission. Temperature, 102.2°. Abdomen flat, distinct rigidity of right rectus, with marked tenderness in right iliac region, where there is also increased resistance. Urine. Very faint trace of albumin and a few hyaline casts, otherwise negative.

Operation (Dr. Harte). Under ether an incision was made in right iliac region and appendix was found to be thickened, inflamed and very rigid, being practically broken off about 1 cm. from its base. Slight adhesions, no pus. Stump of appendix was ligated and excised. Wick of iodoform gauze carried down to bottom of cavity and wound partly closed. Slight fecal discharge which lasted a short time but closed before the patient left the hospital. On discharge there could be felt an irregular, hard mass in region of the wound. Pathological diagnosis. Primary carcinoma of the appendix.

Specimen consists of a small piece of fat and connective tissue about the size of a hickory nut, in the centre of which there is some gray necrotic material. On section the lumen of the appendix is found imbedded in the mass. The mucosa is swollen and red.

**Microscopical Examination** The appendix is the seat of the most extensive changes. No coats but the external muscular can be made out. Everywhere there is extensive infiltration of polymorphonuclear leucocytes and the production of new connective tissue. The lumen is filled with leucocytes and desquamated epithelial cells. Glands are found only in what remains of the mucosæ in one or two sections, they extend from the surface, where here and there the remains of superficial epithelium can be seen, down deep into the appendix wall. They form long irregular ducts or spaces, lined sometimes by several layers of cuboidal or polygonal epithelium, and sometimes completely filled by such epithelium, often the layers of cells are detached from the wall of the space. These irregular ducts and spaces extend into the muscular coat. The stroma of the mucosa and submucosa is entirely destroyed or altered so that the coats are formed of granulation tissue densely infiltrated with polymorphonuclear leucocytes and small round cells. This acute inflammation extends about the appendix into the mesentery and fatty tissues. The growth of ducts and alveoli becomes more irregular and atypical the further they are removed from the lumen of the appendix. They extend into the mesentery and invade the granulation tissue of the region. Sometimes distinct atypical gland-like arrangements exist. The cells forming the invading tumor are very irregular, polygonal, and have variously shaped vesicular nuclei. In the sections where the growth in the mesentery is larger, the gland-like arrangement is very well marked. Sometimes the centre of the gland-like spaces is filled with blood cells.

Patient has been lost sight of.

The following cases have been collected from the literature.

**CASE 1**—ROKITANSKY<sup>60</sup> (1847) (from Elting)—Autopsy on individual aged 82, who died of pulmonary disease. The appendix was transformed into a sac six inches in length and two inches in diameter and was adherent to the posterior side of the cæcum. The walls of the appendix appeared fibrous in character and the cæcal orifice of the appendix was obliterated and the sac thus formed contained a yellowish-white, gelatinous material.

**CASE 2**—ROKITANSKY<sup>60</sup> (1854)—Individual aged 68, who died of pneumonia. The appendix was two inches in length and the distal two-thirds was transformed into a spindle-shaped fibrous sac about the size of a pigeon's egg, which contained a yellowish gelatinous material traversed by fine reticulated processes which took their origin from the wall of the sac.

**CASE 3**—ROKITANSKY<sup>61</sup> (1866)—An individual aged 70, who died of heart disease. The appendix was four inches in length and the distal 2.9 inches was transformed into a sac distended with a gray gelatinous material. This portion of the appendix was about one inch in diameter and the wall was of a fibrous character, from it numerous delicate processes ran in different directions through the gelatinous contents.

CASE 4—ROKITANSKY<sup>30</sup> (1866)—An individual 38 years of age, who died of pulmonary and intestinal tuberculosis. The appendix was 19 inches in length and consisted of two compartments. The distal, lined by a smooth mucosa, contained a grayish gelatinous material, while the proximal compartment was distended with a gelatinous material traversed by numerous delicate strands of tissue, which appeared to originate from the fibrous wall of the compartment.

There is some doubt as to the carcinomatous nature of these cases of Rokitansky as no mention is made of the microscopical structure.

CASE 5—BEGER.<sup>4</sup>—Man aged 47. Three and a half years previously had an abscess in right iliac fossa which on operation yielded a pint of odorless pus, fistula remained and tumor grew through it. No escape of feces or flatus. Operation showed that fistula led directly to appendix which was everywhere infiltrated with carcinoma. The appendix was about six cm in length and about the thickness of one's finger. At the base of the appendix, a walnut-sized papillary tumor projected into the cæcum. The patient died soon after the operation, and at autopsy metastatic involvement of the retroperitoneal glands was found. The microscopic diagnosis was adenocarcinoma.

Rolleston and Jones consider this to be the first authentic case of primary carcinoma of the appendix, and Elting, Baldauf and Zaaier mention it in their lists of cases.

CASE 6—DRAPER.<sup>9</sup>—Man aged 65. Healthy until three months previous when had alternating diarrhœa and constipation. Could not retain food for three months before death. Autopsy. Stenosis of ileocæcal valve. Proximal one-third of appendix dilated to size of a plum. Cæcal juncture also dilated and the thickened wall typical of colloid cancer. Peritoneum normal.

CASE 7—STIMSON<sup>35</sup>—Female, aged 44. Appendiceal attack lasting several weeks ten years previously. Well until two mild attacks two months before operation. "Cancerous degeneration" of appendix. Ring of thickened mucosa projecting into cæcum.

CASE 8—MOSSE and DAUNIC.<sup>41</sup>—Female, aged 50. Had no appendiceal symptoms when she died of cardiac disease. Appendix only organ showing cancerous change. Tumor in mucosa and muscularis in part alveolar and in part cylindrical in type, lumen entirely obliterated.

CASE 9—ROLLESTON<sup>41</sup>—Female, aged 26. Operation during fourth appendiceal attack. First was fourteen months previous. Tip was adherent to ovary and was seat of primary, spheroidal-celled carcinoma size of a marble, which infiltrated almost to serosa. Other viscera appeared normal and were not suspected before microscopical examination. Three months later was losing flesh and strength. (Rolleston and Jones report that she was well five years later.)

CASE 10—A O J KELLY<sup>38</sup>—Clinical history lost. Appendix 11 cm in length, for 3 cm at proximal end the diameter is 8 mm, distal to this it is 1.2 cm in diameter. There are areas of ulceration of the mucosa toward the proximal end, and just distal to these there is an area of tumor formation 6 mm in diameter, this consists of a connective-tissue

stroma which forms alveoli surrounding nests of epithelial cells Diagnosis Carcinoma Good recovery, but since lost sight of

CASE 11—A O J KELLY<sup>28</sup>—Mrs E S, aged 24 Three previous attacks, the last being three weeks before operation No adhesions Appendix 9 cm in length and about 6 mm in diameter Lumen patent Towards the base of the appendix its wall is infiltrated with narrow columns of cells apparently in intimate relation with the surrounding connective-tissue stroma, there being no sharp demarcation between the tumor cells and the stroma as in carcinoma Diagnosis Endothelioma Patient was well when seen ten years later

CASE 12—A O J KELLY<sup>28</sup>—J M, man aged 19 Was well until nine days before operation, when he had symptoms of acute appendicitis with a palpable mass in the right iliac fossa Operation Small encapsulated collection of pus about cæcum and appendix, which latter was 5 cm in length and 1 cm in diameter On removing a coating of fibrinopurulent exudate the appendix proved to be much distorted A microscopically small growth was found almost entirely within the submucosa The tumor cells were arranged in nests supported by a stroma of altered submucosa Diagnosis Carcinoma of the appendix When seen about nine years after the operation patient complained of having had occasional pains in right iliac fossa and has had constant tenderness in the incision No subsequent operations

CASE 13—A O J KELLY<sup>28</sup>—T R, man aged 63 Numerous appendiceal attacks shortly before operation Appendix adherent, and like the intestines was studded with grayish white, miliary nodules Retroperitoneal glands enlarged Patient died from shock Microscopical examination of the appendix showed it to be everywhere the seat of carcinomatous infiltration The invading epithelial cells are sometimes in the form of nests and elsewhere form the walls of hollow tubules

CASE 14—HURDON<sup>21</sup>—Mrs G, aged 24 No symptoms pointing directly to appendix Operation by Dr Kelly for release of pelvic adhesions, suspension of uterus and removal of appendix, which latter was found densely adherent, and bulbous at its free extremity There is a flexion between middle and outer thirds, and proximal to this the lumen is normal To the distal side there is a soft concretion the size of a date stone, and situated in the intervening portion there is a small adenocarcinoma invading all coats In good health when heard from nine months later

CASE 15—GISCARD<sup>18</sup>—Male, aged 37 Mild attack eight months before a more severe one which led to operation in a few days Abscess and local peritonitis Obstruction of lumen at mid-appendix by cicatricial thickening, distal to which there was some pus At this point microscopical examination showed a mixed adenoalveolar carcinoma situated between the mucosa and muscularis and occupying about one-half of the circumference. The tumor seemed to spring from the deeper layer of the glands Good recovery

CASE 16—WHIPHAM<sup>22</sup>—Female, aged 45 Abdominal swelling and

tumor in right iliac region Healthy until five weeks previous when had symptoms of malignant disease but none pointing to appendix Inoperable Mass of intestines and omentum Died in two and a half months Primary spheroidal-celled carcinoma in base of appendix invading all coats but serosa

Of this case Rolleston and Jones say "This case is excluded by several authors on the ground that there were growths also in the glands, liver, and the left ovary, which last they regard as the primary seat of the disease It is, however, accepted by Moschcowitz, who agrees with Whipham that the origin in the mucous coat of the appendix shows that the growth was primary there, a view which we also take"

CASE 17—SUDSUKI<sup>56</sup>—Man, aged 40 Discovered at autopsy Endothelioma the size of a pea found in the lower one-third of an appendix 11 cm in length Lumen patent and mucosa appears normal to the naked eye Microscope shows it to be thin and devoid of epithelium and Lieberkuhn's glands Submucosa compressed, and between it and the muscularis the tumor is found slightly infiltrating the latter and the serosa Endothelium of lymph spaces much proliferated and it is believed that the tumor originated there

CASE 18—MCBURNES<sup>57</sup>—Woman, aged 23 Severe appendiceal attack two years previously No adhesions Two strictures, one near base and the other near apex, where there is a solid tumor the size of a pea "Pure carcinoma" No metastasis

CASE 19—MCBURNES<sup>57</sup> (Lartigau's case)—Man, aged 30 Discovered at autopsy No history of appendicitis "Pure carcinoma," somewhat larger than a pea in tip

CASE 20—GOFFE<sup>57</sup>—Girl, aged 15 Increasing appendiceal pain for one year No mass Typical carcinomatous tumor 5 mm in diameter developed in appendiceal wall at tip

CASE 21—REGLING<sup>48</sup>—Man, aged 59 Attack preceded by anorexia for six months and for last six weeks had cramp-like abdominal pain Abdomen distended Lateral dullness disappearing on change of position No tenderness or mass Symptoms of obstruction led to operation Tumor (scirrhous invading muscularis) size of hen's egg apparently starting from base of appendix invades outer side of cæcum for a short distance Benign obliteration of free end of appendix, other end is a thick-walled dilatation filled with fish bones, etc Stricture at ileocæcal junction due to adhesion of ileum and cæcum but not malignant Carcinoma preceded by chronic inflammation Fecal fistula and death in four months

CASE 22—JESSUP<sup>58</sup>—Married woman, aged 36 Operation for ovarian cyst, following the last of five abortions Appendix found surrounded by adhesions Kink and constriction at junction of middle and distal thirds, beyond which there is a slight dilatation surrounding a firm, yellow adenocarcinoma infiltrating muscular coat There were no symptoms pointing to appendix

CASE 23—HARTE and WILLSON<sup>59</sup>—Maiden, aged 24 Appendiceal attack of one month's duration about five years previously Numerous less severe attacks during entire winter one year previously, but made

apparent recovery until one month before operation when symptoms returned. Operation. Appendix free from adhesions and to naked eye appeared to be normal externally and internally, except for almost entire obliteration of lumen. Local infiltration of all coats by scirrhous carcinoma 1 cm from tip. Patient was well when recently seen seven and one-half years after operation.

CASE 24—HARTE and WILLSON<sup>30</sup>—Frank L, aged 25 (in service of Dr Le Conte). More or less continuous pain in right iliac fossa for eight months. Operation. Appendix adherent behind cæcum and ruptured near tip. Concretion size of grape seed. Sections of appendix about one centimetre from tip showed a carcinoma simplex springing from the mucosa and involving all coats. Acute suppurative appendicitis. Good recovery until four and one-half months later when he had symptoms of intestinal obstruction from a band of adhesions, and bowel found to be gangrenous. No evidences of malignancy. No autopsy.

CASE 25—WEIR<sup>61</sup>—Man, aged 23. History of thirteen attacks of appendiceal pain in two years. Nothing felt through abdominal wall. Appendix strongly kinked and knobbed a little at its end. Pathological Report. Usual inflammatory changes in mucous membrane and a small mass of adenocarcinoma at the tip. Patient remained in good health for three years and was then lost sight of.

CASE 26—WALSHAM<sup>67</sup>—Man, aged 45. Had several appendiceal attacks. Operation. The appendix was thickened and ulcerated and when examined microscopically was found to be the seat of a columnar-celled carcinoma.

CASE 27—NORRIS<sup>44</sup>—Mrs L F, aged 27. No symptoms pointing directly to appendix. Operation for right inguinal hernia and salpingitis. Appendix reddened and adherent at tip, where lumen was occluded by a firm, yellowish-white mass in its terminal centimetre, here there was an old obliteration, but elsewhere evidence only of a mild chronic inflammation. Carcinoma simplex. Well when seen four years later.

CASE 28—MOSCHCOWITZ<sup>40</sup>—I S, male, aged 37. Treated three years for supposed alcoholic gastritis. Later acute appendiceal attack with peritonitis. Operation. Free pus in abdomen. Appendix adherent and slightly gangrenous. Bean-sized adenocarcinoma in tip. No recurrence six and a half years later.

CASE 29—MOSCHCOWITZ<sup>40</sup>—R P, female, aged 20. Ten-day appendiceal attack. Tenderness. No mass felt. Small hard nodule one inch from tip. Carcinoma simplex. No recurrence three years later when lost sight of.

CASE 30—MOSCHCOWITZ<sup>40</sup>—Mrs G D, aged 24. Five months pregnant. Present attack of five months' duration. Irregular fever. Leucocytes, 17,500. Pain in hypogastrium. Exploratory laparotomy negative, except for appendix adherent at tip, here lumen was obliterated and a colloid carcinoma found. No recurrence six months later.

CASE 31—LETULLE and WEINBERG<sup>32</sup>—Male. Discovered at autopsy after death from tuberculosis. Total obliteration of lumen. Small adenocarcinoma at tip starting from centre of old cicatrix.



CASE 32—LETULLE and WEINBURG<sup>25</sup>—Child, aged 12½ History of mucomembranous colic since infancy Two attacks of appendicitis at interval of one year Operation after second attack Appendix adherent and contained an enterolith A carcinoma of the adenocarcinomatous type was located at a point at which a stenosis had resulted from previous inflammation Good recovery

CASE 33—LETULLE and WEINBURG<sup>25</sup>—Female Discovered at autopsy after death from pulmonary tuberculosis Obliteration of lumen in distal 2 cm, where there was an adenocarcinoma below an old cicatrix

CASE 34—LETULLE<sup>24</sup>—L L, male, aged 35 Discovered at autopsy after death from tuberculosis of lungs and intestines Adenocarcinoma size of cherry stone in tip No adhesions

CASE 35—LETULLE<sup>24</sup>—A M, female, aged 39 Discovered at autopsy after death from tuberculosis of lungs, kidneys and intestines Tumor size of hazelnut in tip with obliteration of terminal 4 cm of lumen Secondary to acute appendicitis No adhesions

CASE 36—LETULLE<sup>24</sup>—V C, female, aged 59 Discovered at autopsy after death from pulmonary and intestinal tuberculosis Adenocarcinoma of distal end with obliterated lumen at this point only No adhesions

CASE 37—LETULLE<sup>24</sup>—J P, female, aged 26 Discovered at autopsy after death from pulmonary tuberculosis Scirrhus cancer size of cherry stone in tip Overlying peritoneum normal Adhesions over caecal half of appendix, which is chronically inflamed Meso-appendix involved

CASE 38—LEJARS<sup>23</sup>—Male, aged 27 Slight appendiceal attacks for three months, becoming more severe At time of appendectomy caecum looked normal and there were no adhesions or swollen mesenteric glands Second operation two months later General metastasis Microscopically no portion of appendix proved to be free from carcinoma Polyhedral-celled type of trabecular tendency

CASE 39—ELTING<sup>18</sup>—Mrs L, aged 36 Good health until eight years previously, when she had an attack diagnosed peritonitis No more trouble until shortly before she had a bilateral salpingo-oophorectomy No symptoms of appendicitis Appendix, although apparently normal, was removed as a precautionary measure and was found to contain a small alveolar carcinoma 1 cm from the proximal end Lumen everywhere obliterated In good health three years later

CASE 40—ELTING<sup>18</sup>—W D, male, aged 81 Autopsy after death from pulmonary tuberculosis and cardiac disease No symptoms of appendicitis Colloid carcinoma of appendix No metastasis

CASE 41—EDINGTON<sup>22</sup>—Mr P, aged 44 Diagnosed appendicitis Had symptoms of "stomach catarrh" for two years Operation Body of appendix buried in adhesions (mesoappendiceal and enlarged glands) but tip was free Proximally the appendix was quite narrow, distally thick, hard and bulbous On passing the hand toward the pylorus, a hard band of omentum was found kinking the bowel and was removed Patient gradually became weaker and died in three months Microscopical examination shows a general adenocarcinomatous infection All coats are involved

CASE 42—KAUFMANN<sup>25</sup>—Woman, aged 31 Discovered at autopsy

after death from typhoid fever Muscular coat of appendix almost destroyed by a diffuse, solid, round-cell carcinoma

CASE 43—JONES and SIMMONS<sup>24</sup>—Female, aged 26—Six appendiceal attacks in twelve years Tenderness, but no mass Adhesions seen with microscope only Scirrhus carcinoma near base Small section of cæcum removed at second operation and found to be normal Also chronic appendicitis Good recovery and well eight months later

CASE 44—ECCLES<sup>11</sup>—Male, aged 18 Two typical appendiceal attacks in two months Adherent thickened appendix Two separate, small tumor masses in wall of appendix, one at junction of proximal and middle two-thirds and the other a little more distal Spheroidal-cell cancer Was well twenty-two months later

CASE 45—CULLINGSWORTH and CORNER<sup>8</sup>—Maiden, aged 31 Two attacks of pain in right side in two weeks Operation for fibromyoma of broad ligament Appendix was removed on account of bulbous extremity which was found to contain a small spheroidal-cell carcinoma Lumen obliterated at tip only Eight months later patient was well but had no appetite

CASE 46—BURNAM<sup>6</sup>—Man, aged 25 Recurrent appendiceal pain for two years Appendix adherent to its meso at tip and acutely inflamed, especially to outer third where adenocarcinoma fills lumen and invades mucosa and muscularis

CASE 47—WEIR,<sup>61</sup>—Male, aged 22 Emaciation, cough and abdominal distention, with ascites for two months Was thought to have tubercular peritonitis but the fluid injected into guinea pigs gave negative results Operation revealed a large number of subperitoneal metastatic nodules but none in viscera Transformation of appendix into a mass of mucoid carcinoma No adhesions

CASE 48—WEINBERG<sup>62</sup>—M J, male, aged 22 Two appendiceal attacks, six years and one year previously Lumen obliterated in terminal 2 cm, and here author thinks there is absolute proof that the epithelium has developed in an obliterating cicatrix, at the expense of a portion of a gland which escaped the inflammatory process and was caught in the cicatrix Patient well four months later

CASE 49—SARGENT<sup>63</sup>—Girl, aged 12 First attack Abscess Appendix acutely inflamed Changes most marked beyond a pea-sized tumor which obstructs lumen half an inch from cæcum Endothelioma Was well five months afterwards (The microscopic section from this case was seen by Rolleston and Jones who say that it is very difficult to state positively that it is not a spheroidal-cell carcinoma)

CASE 50—NERI<sup>42</sup>—E B, male, aged 29 who had repeated attacks of pain in the cæcal region following a kick in that part five years previously The appendix, removed at operation, showed a primary adenocarcinoma in the middle of a chronically inflamed organ There was no metastasis

CASE 51—MYERSTEIN<sup>42</sup>—Female, aged 26 Discovered at autopsy, after death from hæmoptysis Carcinoma simplex with traces of alveolar type invading all coats in distal half of appendix

CASE 52—KUDO<sup>80</sup> (Einlauf No 876, 1905, Prosektor) —Boy, aged 8 Operation for acute perityphlitis Tumor size of a pea in middle of appendix, invading submucosa Muscularis and serosa not invaded Carcinoma simplex

CASE 53—KUDO<sup>80</sup> (sections Jour No 549, 1905, Path Inst) —Man No history of appendicitis Autopsy Appendiceal opening enormously dilated and hard tumor the size of a walnut protrudes 1 cm into cæcum Adenocarcinoma with transition into carcinoma simplex

CASE 54—KUDO<sup>80</sup> (Einlauf, No 1507, 1905, Prosektor) —Man, aged 35 Acute appendicitis Nodule size of a pea springing from mucosa at tip Muscularis but slightly invaded Carcinoma simplex

CASE 55—KUDO<sup>80</sup>—Woman, aged 26 Tumor size of a cherry obstructing lumen in proximal end Middle third obliterated Carcinoma simplex

CASES 56-57-58—KORTE<sup>79</sup>—Unexpectedly came across three cases of carcinoma of the appendix in youthful individuals from 12 to 28 years of age Once in an interval operation and twice while operating for acute appendicitis Microscopical diagnosis of all three was adenocarcinoma and all were living at the time they were reported

CASE 59—H KELLY<sup>78</sup> (Thorndike, Boston City Hospital) —Woman, aged 30 Seven years of recurrent appendicitis, becoming severe one week before operation Appendix thickened, distal portion cystic, and base indurated and carcinomatous A portion of cæcum removed with appendix Microscopical Examination Small alveoli lined with columnar cells, which often entirely fill the lumen All coats to serosa involved Uneventful recovery

CASE 60—H KELLY<sup>78</sup> (Monks, Boston City Hospital) —Woman, aged 24 First attack, two days' illness and epigastric pain becoming localized in right iliac fossa Moderate tenderness to left and below umbilicus Operation Appendix twisted on itself Bulbous tip enveloped in mass of inflammatory exudate Easily separated Yellowish nodule 0.6 cm in diameter, 1.5 cm from tip Adenocarcinoma replacing mucosa and invading muscularis Slight chronic appendicitis Uneventful recovery

CASE 61—H KELLY<sup>78</sup> (J H H, Surg, No 9037) —Colored man, aged 19 History of abdominal cramps (recurrent) but no definite appendiceal attacks Symptoms of acute appendicitis for ten days and extremely painful mass in right iliac fossa which proved to be omentum surrounding a small fetid abscess Temperature, 101.8° F pulse, 110, leucocytes, 16,000 Appendix thickened and adherent to wall of abscess Two cm of median portion of lumen obliterated by an alveolar carcinoma invading all coats Small perforation at distal end of tumor Uneventful recovery

CASE 62—DRIESSEN<sup>70</sup>—Removed an appendix from a young married woman after a third attack of appendicitis The appendix showed a small alveolar carcinoma in the middle of a chronic inflammatory mass which obliterated the lumen of the organ at its middle There had been no recurrence after five and a half years

CASE 63—BATTLE<sup>8</sup>—Girl, aged 14 Four appendiceal attacks in one year Operation Mass of omentum adherent to bowel Appendix removed

with difficulty Was twisted on itself One constriction near distal end which cut off marble-like portion full of pus, and another a little nearer cæcum beyond a hard, yellowish-white, spheroidal-celled carcinoma the size of a marble

CASE 64—BARROW<sup>2</sup>—A H, girl, aged 18 First attack Symptoms of appendicitis following diphtheria, together of one month's duration Bulbous tip of appendix adherent to posterior wall of cæcum Local area of inflammation in cæcum, colon and ileum but apparently no malignant infiltration Mesenteric glands enlarged Cancerous involvement of bulbous, distal one-third of appendix only, where there were two small tumor nodules Polymorphous type

CASE 65—BALDAUF<sup>1</sup> (Bender Lab 128-1904)—Mr H, aged 38 Previously well Symptoms of appendicitis the day before operation Appendix bound down by adhesions and underneath umbilicus Beginning peritonitis Easy removal Uneventful recovery Pathological Examination Appendix considerably thickened and covered with fibrin Lumen patent Mucosa injected and the seat of foci of necrosis Anatomical Diagnosis Acute appendicitis Microscopical Examination At mesenteric side, mucosa is ulcerated and replaced by a new growth invading all coats and infiltrating meso Microscopical Diagnosis Carcinoma simplex with ulceration Acute appendicitis Periappendicular suppuration

CASE 66—BALDAUF<sup>1</sup>—Mr B, aged 23 Two appendiceal attacks six and five months previous, and a last beginning five days before operation Clinical Diagnosis Subacute appendicitis Appendix removed with difficulty Pathological Examination Obliteration of lumen Fibrous tags externally Tumor not suspected until Microscopical Examination Mucosæ replaced by carcinoma simplex invading muscularis, and to mesenteric side, subserous tissue

CASE 67—BALDAUF<sup>1</sup>—Girl, aged 8 Previous history negative No symptoms referable to appendix until two days before operation, when she had a severe appendiceal attack Appendix surrounded by inflammatory mass which ruptured during removal and a small amount of pus escaped Pathological Examination Proximal half normal, other end thickened and indurated and surrounded by a layer of partially organized tissue Lumen normal Anatomical Diagnosis Partial organization of periappendicular abscess Microscopical Examination Carcinoma simplex involving submucosa Muscularis uninvolved

CASE 68—WARTHIN<sup>12</sup>—Married woman, aged 32 Salpingitis with mass of adhesions involving ovary, appendix, cæcum and small intestine Appendix alone carcinomatous and lumen obliterated No naked eye evidences of malignancy Microscope showed involvement of all, including proximal, sections so condition may have extended into cæcum Basal-celled carcinoma Was well three years later

CASE 69—LANDAU<sup>31</sup>—Woman, aged 33 Currettement at eighteen followed by violent local peritonitis Operation for removal of myoma of uterus and left-sided adnexæ Removal of appendix which was rigid, bent on itself in several places and thickened at the apex Its mesentery adherent to colon Length 65 cm Proximal half short and normal, tip

hard No enlarged glands Microscope shows carcinoma simplex

CASE 70—ZAAIJER<sup>64</sup>—Woman, aged 37 Chronic appendicitis with exacerbations Numerous adhesions found at operation Chronically inflamed mucosa with traces of acute abscess formation Pea-sized tumor at apex showing, histologically, a solid alveolar carcinoma Walls infiltrated to subserosa

CASE 71—ZAAIJER<sup>64</sup>—Girl, aged 20 Symptoms of hysteria and chronic appendicitis Operation Appendix somewhat thickened, with local, chronic periappendicitis At apex, an obliteration 1 cm in length was the seat of an extremely small neoplasm (0.5 x 1.1 x 1.1 mm) No apparent connection between this and the surface or glandular epithelium Diagnosis Carcinoma solidum diffusum

Patient showed no evidence of recurrence fourteen months later

CASE 72—ZAAIJER<sup>64</sup>—Miss —, aged 26 Vague abdominal symptoms for several years culminating finally in a well-marked appendicitis Appendix firmly adherent, with tumor 3½ cm long in tip Mixed adeno- and cylindrical-celled carcinoma Infiltration of mesentery, and extension along blood vessels to peritoneum No sign of recurrence six months later

CASE 73—ZAAIJER<sup>64</sup>—Man, aged 25 Chronic relapsing appendicitis for thirteen years Operation Marked adhesive periappendicitis Mucosa and glandular tissue atrophic Submucosa greatly thickened Gelatinous mass size of a lima bean in apex Appearance was that of colloid cancer, although positive proof of this could not be given even with the microscope

CASE 74—ZAAIJER<sup>64</sup>—Girl, aged 23 Appendectomy one month after a first, slight attack of appendicitis Appendix showed a marked chronic inflammation, with a pea-sized tumor near the tip, projecting polyp-like into the lumen Infiltration of submucosa, muscularis and mesentery Tumor was partly adenomatous and partly of the solid type No evidence of recurrence two and a half years later

CASE 75—ZAAIJER<sup>64</sup>—Girl, aged 12 Appendectomy one month after first attack Evidences of chronic appendicitis, especially in subserosa In the tip was found a bean-sized carcinoma of the round-celled type which had compressed the surrounding tissues but had infiltrated the muscularis at but one point No evidence of recurrence after three years

CASE 76—ZAAIJER<sup>64</sup>—Girl, aged 17 Appendectomy after two weeks of appendicitis Stricture 2 cm from tip Proximal portion of stricture contained a pea-sized carcinoma of the solid type with adenomatous tendency

CASE 77—SCHRUMPF<sup>64</sup>—Woman, aged 35 Discovered at autopsy after death from transverse myelitis Small, hard tumor the size of a hazelnut at distal end of appendix Serosa pale and unirritated Mucosa replaced by adenocarcinoma which infiltrates the submucosa and at one point the muscularis

CASE 78—PATEL<sup>64</sup>—Man, aged 58, who had had double inguinal hernia for twenty-five years For last two months the right hernia was painful and of late could not be returned as formerly Operation Appendix found lying free in sac with its tip distended and filled with small

foreign bodies, one of which resembled a fish bone and another a scale of enamel. The wall was thick and hard and on microscopical examination the tip was found to be the seat of a scirrhus carcinoma. Good recovery.

CASE 79—MASON and RHEA<sup>33</sup>—F H, housewife, aged 22. Three gynaecological operations in three years. During the last the appendix was removed although apparently normal and microscope showed scirrhus cancer in tip. No metastases found in the other organs examined.

CASE 80—HESSBERG<sup>22</sup>—Female, aged 76. Found at autopsy. No history of appendiceal trouble. Appendix sprung from posterior wall of cæcum and was wound around latter so that appendiceal lumen was only visible to microscopical examination. Tumor nodules the size of a pea. Carcinoma simplex.

CASE 81—HENKING<sup>20</sup>—Man, aged 23. History of diarrhoea. Appendix removed two years ago, ever since has had pain in right iliac fossa which has increased in the last three months. Six months before lost a pint of blood by bowel. Abdomen tender, especially in right iliac fossa, where there is dulness and fluctuation. Operation. Abscess in scar tissue. Second operation ten days later. Medullary carcinoma of stump of appendix invading ileum and cæcum which were resected. Gelatinous swelling of peritoneum.

CASE 82—GRUNBAUM<sup>18</sup>—Female, aged 19. Violent pain in cæcal region one month before admission. During operation for pyosalpinx appendix was found adherent to reddened and enlarged ovary. Tip of appendix thickened and the seat of a yellowish, dense carcinoma simplex invading all coats. Mesenteric glands uninvolved. No metastasis into tubes or ovaries.

CASE 83—BRANDTS<sup>5</sup>—Boy, aged 8. Ten weeks before admission had pain in right iliac fossa, fever, distention, and obstinate constipation. Second attack six weeks later and third attack four days before operation with vomiting, etc. Operation. Intestines covered with fibrin. Appendix was perforated to the proximal side of a small mass. Removal. Appendix 6 cm. in length.

Microscope shows the small mass to be a solid carcinoma to which the perforation was secondary. Necrotic inflammation. The carcinoma produced stenosis, and inflammation followed.

CASE 84—BRANDTS<sup>5</sup>—Man, aged 35. Had pain in right hypochondrium for several years, was frequently jaundiced and had clay-colored stools. Also attacks of pain in right iliac fossa. Physical Examination. Tenderness over gall-bladder and appendix. No tumor in liver region. Operation. Gall-bladder and ducts negative. Appendix 8 cm. long with small tumor in its tip. Microscopical Examination. Scirrhus, with suspicion of adenocarcinoma.

CASE 85—MCWILLIAMS<sup>28</sup>—Maiden, aged 20. Never sick until had typical, acute appendiceal attack on arrival at Ellis Island. Three ounces of pus evacuated. Enteroliths and muco-pus in lumen, also spheroidal-celled scirrhus cancer size of a pea in tip. All coats but serosa invaded.

CASE 86—OBERNDORFER,<sup>45</sup> in speaking of small intestinal cancers that had come under his observation, mentions a carcinoma of the appendix.

in a boy of seven years of age As no details are given, this case is of a doubtful nature

CASE 87—WHITE<sup>63</sup>—Woman, aged 75, died on the ninth day of an attack of acute intestinal obstruction due to a Richter's hernia into the right femoral ring Thirty-five years previously she had what seems to have been an attack of acute appendicitis At autopsy the appendix was found bound down to the posterior wall of the abdomen by dense adhesions and was two and one-half inches in length and, toward the distal extremity, one-half inch in diameter Microscopically there was an irregular overgrowth of epithelium invading the deeper tissues In places there was a glandular formation, but most of the cells had undergone a complete colloidal degeneration A single gland at the ileocæcal angle was enlarged to the size of a cherry and proved to be carcinomatous The cæcum and other viscera were free from infection

CASE 88—A O J KELLY<sup>27</sup>—Mrs S B, aged 23 Severe appendiceal attack five years, and mild attack four weeks before Constipated since first attack Palpation negative except for local tenderness Operation Appendix kinked on itself and curled around cæcum Appendix cut out of cæcum On section a new growth is seen to extend from the tip, almost if not quite, to the proximal end All coats are invaded and the thickness of the organ is increased The lumen is almost completely occluded except at proximal end Microscopically there are lesions of chronic appendicitis with evidences of acute exacerbation The epithelial cells are arranged in nests and some have undergone mucoid change In good health one year after operation

CASE 89—A O J KELLY<sup>27</sup>—Miss F L B, aged 17 Eight hours before admission to hospital was seized with acute, general abdominal pain, gradually becoming localized in right iliac region Abdomen rigid on right side and local tenderness over McBurney's point No mass Operation The appendix, which was nonadherent, was 9.5 cm in length and about 1 cm in thickness, the distal 6 cm being the more distended The serosa was coated with fibrin About midway a well-marked constriction was found separating proximal and distal portions, and the latter was filled with a sanguinopurulent material Macroscopical evidences of a new growth were first seen while sections were being prepared for microscopical examination A small infiltration of the submucosa, opposite the mesentery, extended 1.5 cm from the constriction to the proximal end Microscopically there were evidences of a moderate grade appendicitis The tumor consisted of narrow columns of cells infiltrating the submucosa In some regions the origin of the cells from the endothelial lining of the lymph channels is obvious in their lining such spaces Microscopical Diagnosis Endothelioma and acute appendicitis

CASE 90—A O J KELLY<sup>27</sup>—Miss L B, aged 27 During last two years has had severe attacks of pain in upper right abdominal quadrant During first attack had a chill and pain was referred to right shoulder Was jaundiced for two months Operation Gall-bladder normal Appendix 8 cm long and 0.3 thick, except for a bulbous enlargement 1.3 cm at tip New growth was not observed on macroscopical examination, but

was later found to comprise a small nodule about 3 mm in diameter extending 2 cm from the tip of the organ. The tumor consists of nests of epithelial cells supported by a well-developed connective-tissue stroma, the submucosa especially is the seat of the infiltration, but the muscularis is also slightly invaded even to the subserosa. Diagnosis Carcinoma and chronic appendicitis with exacerbation. Uneventful recovery.

CASE 91—A O J KELLY<sup>27</sup>—Miss M K, aged 28. Previously well. Attack began a few days before operation with severe cramp-like pains in abdomen which became localized in right iliac fossa. There was marked rigidity and tenderness of the right abdomen, with nausea and vomiting, and a definite mass could be palpated. Operation. Considerable pus evacuated. Appendix acutely inflamed, perforated and adherent to colon. The appendix was 6 cm long and from 0.6 to 1.5 cm in thickness. The tip was much dilated—the lumen to 0.8 mm in diameter and contained a hard calculus. The tumor could only be detected with the microscope, which revealed evidences of acute inflammation and showed the new growth to be limited to the tip. It consists of nests of epithelial cells, in a well-developed connective-tissue stroma, replacing the mucosa and infiltrating the muscularis. Diagnosis Carcinoma and acute ulcerative appendicitis with perforation. Uneventful recovery.

CASE 92—LE CONTE<sup>32</sup>—T R, woman, aged 21. Attacks of sharp pain in appendiceal region for ten years. Final attack lasted one week. Violent pain, soreness and palpable tumor size of a hickory nut in same region, and nausea.

Intussusception of appendix into cæcum with tip protruding. Ileocolic glands enlarged. Portion of cæcum excised with appendix, and pathological report suggested a wider carcinomatous involvement. Six weeks later a more extensive resection was performed with removal of seven inches of bowel and a number of mesenteric glands, two of which showed metastatic involvement from the primary adenocarcinoma in the appendix.

#### FOLLOWING ARE THE BRIEF RÉSUMÉS OF THE CASES OF SARCOMA OF THE APPENDIX

CASE 1—GILFORD<sup>14</sup> (Sarcoma)—Woman, aged 27, with symptoms of chronic appendicitis for thirteen years. Spindle-cell sarcoma of appendix which was adherent to colon and ileum, which were uninvolved.

CASE 2.—GLAZEBROOK<sup>16</sup> (Sarcoma)—G G, colored man, aged 55. Discovered at autopsy after death from apoplexy. Appendiceal adhesions. Dense, fibrous, endothelial sarcoma the size of a pigeon egg, near tip. Originated in serosa and invaded all coats.

CASE 3—WARREN<sup>53</sup> (Sarcoma)—Boy with symptoms of chronic appendicitis, intermittent pain, and fever for one month. Tumor of ileo-cæcal angle with involvement of appendix. Round-cell sarcoma with glands extending to root of mesentery. Was well four years later.

CASE 4—PATTERSON<sup>47</sup> (Sarcoma)—Man, aged 39. History of uneasiness in right iliac fossa for three months. Occasional sharp pain. No vomiting until acute attack before operation. Tender mass in appendiceal region. Operation. Appendix thick, firm, and adherent. Cæcum



thickened for one-quarter inch about appendix Thickened portion of cæcum removed with appendix Patient died six hours later Autopsy No trace of tumor elsewhere Round-cell sarcoma beginning in appendix and involving all coats with exception of serosa

CASE 5—CARVARDINE<sup>7</sup> (Sarcoma)—Female, aged 45 Symptoms of appendicitis for five months Severe pain in right iliac fossa, diarrhœa and frequent attacks of severe colic Tenderness and deep-seated swelling in same region Operation Appendix three and a half inches long and the size of one's thumb, very hard, adherent, olive-shaped tip Cæcum not involved but head and neighboring enlarged gland removed Recurrence on left side Death nine months later Microscope shows lymphosarcoma

CASE 6—CARVARDINE<sup>7</sup> (Sarcoma)—Man Appendix removed for relapsing appendicitis The central portion contains a small fecal concretion, and in the apex there is a whitish tumor the size of a hazelnut Several of the neighboring glands are enlarged Microscopically the tumor consisted almost entirely of lymphoid tissue Author speaks of it as a lymphosarcoma (also as a lymphocytoma)

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# CARCINOMA OF THE APPENDIX WITH METASTASIS TO THE ILEOCOLIC GLANDS.\*

BY ROBERT G LE CONTE, M.D.,

OF PHILADELPHIA, PA.,

Surgeon [to the Pennsylvania Hospital

THE subject of carcinoma of the appendix has been extensively reviewed by my colleague, Dr Harte, and it is clear that the diagnosis of this disease, when limited to the appendix, cannot be made before operation. Even after operation the pathologist is generally the first to discover its presence in an organ removed for other causes. In the majority of cases the disease seems to be entirely confined to the appendix, and the removal of that organ brings about a cure. In a few cases, however, microscopical examination reveals that the disease has gone beyond the appendix, and these cases are of special interest to the surgeon, for they compel a second more or less dangerous operation. I desire to report a case of this type in which the primary growth in the appendix had spread to the cæcum and presented metastases in the ileocolic glands.

A B, aged 21, female, single, white, American. The family history was negative, except that many members were rheumatic, the patient herself being a frequent sufferer. She had had most of the diseases of childhood, including scarlet fever followed by nephritis. From the age of eleven, that is, for ten years, she had had repeated attacks of sharp pain, localized in the right iliac fossa, sometimes with chilly sensations and slight fever, at other times with no disturbance of temperature. The sharp pain would last from a few hours to a day or two, and subside with a feeling of soreness. These attacks were usually attributed to some indiscretion in diet.

April 20, 1907, the patient was seized with violent pain in the appendix region while at dinner, the pain was so severe that she almost fainted. She had chilly sensations and felt slightly

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feverish, had nausea but no vomiting. After a couple of hours the pain lessened in severity and was followed by a feeling of discomfort and soreness in the right iliac region. During the next five days she had several slight attacks of this colic. I saw the patient in consultation with Dr Henry C Earnshaw four days after the onset of the attack.

*Physical Examination*—Thin but not emaciated, color good, slight lateral curvature of spine. Chest negative. Temperature and pulse normal. Abdomen retracted, no rigidity; slightly tender mass the size of a hickory-nut palpable in appendix region. Cæcum distended with gas. Urine contained a trace of albumin but no casts. There was some anæmia. R B C, 4,264,000, Hb, 75 per cent, leucocytes 8,600. Operation was advised and accepted.

April 27, 1907, the abdomen was opened through a gridiron incision and the palpable mass was found to be an intussusception of the appendix into the head of the cæcum. About an inch of the tip of the appendix was visible beyond the cæcal margin. The portion within the cæcum was almost round and nearly an inch in diameter. It felt like an inflammatory mass and was thought to be due to the chronic condition of the intussusception. The portion of the cæcum containing this mass was resected and the opening closed with Lembert sutures. A small pin-head sized pearly mass was noticed on the cæcum an inch beyond the area resected, but at the time of operation nothing was thought of it. The ileocolic glands were somewhat enlarged. The abdomen was closed with layer sutures and the recovery was uneventful. The patient was discharged from the hospital May 11, 1907, in good condition, weighing 116 pounds.

The examination of the specimen was made by Dr Warfield T Longcope, Director of Ayer Clinical Laboratory, and the findings confirmed by Prof Allen J Smith, of the University of Pennsylvania.

*Pathological Report*—The specimen consists of a portion of the cæcum and the appendix. The major portion of the specimen consists of a rounded, mulberry-like mass,  $2\frac{1}{2}$  cm in diameter, which has a mottled red and yellow surface. This is said to be the mucous membrane of the colon, though it has lost all resemblance to normal mucous membrane.

Towards the middle of the specimen there is a collar-like contraction

and the colon surface forms a little frill about it. Coming out from this collar is the tip of the appendix which forms a curved bulbous knot about 2 cm in length and 1 cm in diameter. The surface is fairly smooth and white. Here and there are a few yellow pin-point nodules. It has a cystic feel. When it is opened a thick buttery material escapes. The lining is thick, opaque and white. The lumen can readily be found, and a probe passes into it from the colon and out through the most prominent portion of the main mulberry-like mass. Evidently there is a partial invagination of the appendix in the colon.

Sections are made through the tip of the appendix. It has been opened. Instead of the mucous membrane there is an irregular growth of cells arranged in more or less solid alveoli. The spaces filled with cells are separated by a moderate amount of connective tissue stroma. The cells forming these nests are oval, regular, and contain quite deeply staining round nuclei. The protoplasm is poorly made out. No karyokine figures are seen. Here and there a space is seen lined by high columnar epithelium filled with mucus. They resemble the normal crypts of the appendix. The growth is seen extending down into the submucosa and infiltrating the muscular coats. The small nodule on the external aspect of the appendix is composed of a growth like that of the appendix itself.

When it was discovered that the appendix was the seat of a carcinomatous growth, sections were made through the portion of the appendix invaginated in the cæcum and through the wall of the cæcum itself. The sections present a curious appearance. The sections in general show four definite zones. A central cellular area, a wide zone of smooth muscle, beyond which is a second cellular zone covered by the fourth zone formed by the mucous membrane of the colon. In the centre corresponding to what should be the lumen and mucous membrane of the appendix, is a solid growth of small polyhedral cells arranged in large spaces separated by a delicate or fairly thick connective tissue stroma. Surrounding this central growth is a wide circular band of smooth muscle which evidently represents the muscular coats of the appendix and cæcum. In some sections this band is complete and unbroken, while in others it is infiltrated more or less extensively with the cells of the growth. Outside of the smooth muscle ring is the second cellular zone, which evidently takes the place of the submucosa of the colon. This zone is quite wide and is made up almost exclusively of irregular solid masses of cells of the new growth, which are separated by a connective-tissue reticulum. In many places this growth in the submucosa is separated from the mucosa definitely by the muscularis mucosa. The mucosa itself looks thin, the crypts are not numerous, and the stroma is filled with small round cells. In other sections the muscularis mucosa has been destroyed and there is direct connection between the growth in the submucosa and the mucous membrane.

In a few places in the sections comparatively normal crypts of Lieberkuhn are seen, but usually replacing the crypts there are irregular tortuous spaces, extending from the surface into the solid growth below, which are partially or entirely filled with the polyhedral cells form-

ing the new growth The stroma between is œdematous and infiltrated with polymorphonuclear leucocytes, small round cells and epitheloid cells

Such sections suggest that the growth may have originated from the glands of the mucous membrane of the cæcum, but it is difficult to say whether the growth extends down from the mucosa or up from the more extensively involved submucosa From the fact that the entire appendix, even to its tip, is the seat of a growth, and from the fact that the mucous membrane of the colon shows a new growth in only one or two places where there is a direct connection between the growths in the submucosa, it seems reasonable to suppose that the carcinoma arose from the appendix and involved the cæcum by direct extension of the growth

*Diagnosis*—Carcinoma arising in the appendix Invagination of appendix into cæcum with extension of growth to that portion of cæcum which surrounds the appendix

The pathological findings were fully discussed with the father of the patient, and after some delay a second operation was agreed to

June 11, 1907, an incision was made through the right rectus muscle, and the cæcum with three or four inches of the ileum was resected, including the entire group of ileocolic glands A lateral anastomosis was made with rubber-covered clamps and Pagenstecher thread As the mesenteric vessels were ligated as near the back as possible, there was a slight hemorrhage from one of the vessels before it was secured with forceps This deep removal of the mesentery was done to insure the complete removal of the ileocolic glands The wound was closed without drainage

For 48 hours after operation the patient was quite ill, with vomiting, distention and signs of intestinal paresis The bowels were finally moved, the vomiting ceased, and from then on the recovery was uneventful

The patient left the hospital at the end of three weeks weighing 113 pounds Two months after the operation her weight had increased to 121 pounds, and March 1, 1908, her weight was 129 pounds Her best weight previous to these operations had been 132 pounds She is apparently in perfect health

*Second Pathological Report*—The specimen consists of the cæcum and about 10 cm of the ileum The ileum to the right of the specimen is bound by adhesions to the cæcum The line of junction is covered by a delicate film of connective tissue The point of excision of the invaginated appendix is entirely hidden At the point where the ileum and cæcum are adherent there are, deep down, firm adhesions A number

of the ileocolic glands and the mesentery are included in the specimen. On opening the intestine a thick, yellowish-green material escapes from the ileum. The cæcum is filled with the same material. The mucous membrane looks pinkish, soft and apparently normal. In the deepest part of the cæcum is a dimpled scar in which one sees a stitch. At the base of this point the cæcum and ileum are adherent and the adhesions, though not extensive, feel hard. The mesenteric lymph-nodes vary from 0.5 to 1.5 cm. in diameter. They are regular but quite firm and white. On section some of them show small whitish points along the periphery.

*Microscopical Examination*—Sections are made through the adhesions at the seat of operation, through the ileum and colon above and below the seat of operation and through eleven of the mesenteric lymph-nodes. *At the seat* of the operation the section includes a few of the stitches. The subperitoneal surface of the colon and ileum are adherent. Between these surfaces there is a little blood, fibrin and granulation tissue. There is a general infiltration with small round cells, epithelial cells, plasma cells and a few polymorphonuclear leucocytes. About the remains of the stitches there are many foreign body giant cells. The mucous membrane of the colon and the ileum is slightly oedematous. The lymphoid follicles are greatly swollen and the germinal centres show hyperplasia. In the mucous membrane of the ileum, and especially of the colon, there are great numbers of eosinophiles. There are no evidences of tumor growth.

*Sections through the colon and ileum* below and above the operation wound appear normal except for swelling of the lymphoid tissue. *All the mesenteric lymph-nodes* show some swelling of the lymphoid tissue with some endothelial proliferation. Many of the lymph sinuses are dilated. Occasionally they contain many lymphoid cells. In two of the lymph-nodes metastases are found. They lie in the peripheral sinuses, localized fairly well in one position. In one gland the metastases also extend into the sinuses surrounding one follicle. The cells have a gland-like arrangement, suggesting very closely the structure of the original growth. The cells are columnar or cuboidal, and lie in columns and rows. The protoplasm is granular and the nuclei oval and pale. A few karyokinetic figures are seen.

*Diagnosis*—No return of growth found at seat of operation. Metastases to two mesenteric lymph-nodes.

The second operation seems to have been fully warranted by the metastases found in the ileocolic glands, and the judgment of the two pathologists who examined the specimen in urging a second operation proved correct. While it was rather anticipated that we would find in the cæcum areas of malignancy, particularly at the pinhead-sized pearly spot which was noticed at the time of the first operation, yet a careful

examination of all the tissue removed failed to reveal any malignancy except in the mesenteric glands

The sequence of events in this appendix might be explained in two totally different ways. First, that the epithelial growth was of the character of the small benign tumors sometimes found in different parts of the intestinal tract, and which may be present for long periods of time with very slow growth. Such a tumor through the slow formation of fibrous tissue may have drawn the appendix within the cæcum, and after the growth had invaded the walls of the cæcum through extension, metastasis to the ileocolic glands followed. In other words, the tumor may have been practically local and latent until the cæcum was invaded, when its malignant characteristics developed.

Second, that the appendix had been the seat of long-standing chronic disease which recently had undergone malignant change, the operation uncovering it in its early stages. The pathologists, I believe, would rather favor the first view expressed.



## SPLENECTOMY IN BANTI'S DISEASE,<sup>\*</sup>

FOLLOWED BY OEDEMA OF THE LARGE INTESTINE WITH LOCALIZED NECROSIS OF  
ITS WALL

BY JOHN E SUMMERS, Jr, M D,

OF OMAHA, NEB

THE subject of this report was referred to me by Dr W F Milroy from the Medical Service of the Douglas County Hospital, Omaha, and in making this reference the following was submitted

*History*—John K, aged twenty-one, American, height, five feet eight inches, weight, one hundred and fifty-six pounds, occupation, cook, entered the hospital December 1, 1906 His family history was negative For two or three months each spring, from the time he was a young child until his thirteenth year, he suffered from diarrhoea, being well the remainder of each year When thirteen years old he was in bed four months with diarrhoea Eight or ten times during this attack he passed a little blood mixed with mucus After this illness there were similar ones of mild character, becoming less severe each summer This trouble has not recurred since 1903

In 1902 the patient had his body severely squeezed between two cars, and immediately vomited about a teacupful of blood There was no other blood passed at that time

In the spring of 1905 he was very sick for two weeks with malaria In the fall the malaria recurred twice, but was controlled by quinine Later, having discovered a tumor in his abdomen, he was told by a physician that this was his spleen

At about 8 00 P M, August 5, 1906, the patient fell, his abdomen striking heavily across the edge of a board. He felt sick and faint and went to bed He had a good night and felt well next morning At breakfast he was nauseated and began to vomit blood The first was dark and clotted, afterward it was bright red A small amount of blood was also passed from

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<sup>\*</sup> Read before the American Surgical Association, May 6, 1908

the bowel He was put to bed, where he remained two weeks On November 30, while standing in the street, he discovered blood running from his bowel The quantity was estimated at eight ounces There was no vomiting, the next stool contained blood

*Physical Examination* —Lungs normal A well-marked and widely distributed mitral systolic murmur with strongly accentuated pulmonic second sound was present Left border of the heart nearly one inch to the left of the midclavicular line and the right border one inch to the right of the right sternal line Liver apparently about normal in size Tenderness in the left hypochondriac region The spleen reaches from the seventh rib to within two finger-breadths of the level of the umbilicus and as far as the left parasternal line

There was a moderate amount of ascites but no other dropsy

*Urinary Examination* —Negative

*Diagnosis* —Trauma, cancer, peptic ulcer, and decompensated valvular lesion are readily eliminated Although the malarial organism has not been found in repeated blood examinations, it can hardly be doubted that the patient has had that disease However, the first hemorrhage occurred three years before the patient contracted malaria The exsanguinating hemorrhage of August 5, 1906, took place when the patient was in the best of health, and ascites is not caused by malaria under conditions like the present

Tubercular peritonitis is suggested by the history of the prolonged intestinal trouble and ascites The following considerations negative this theory first, the good general nutrition of the patient, second, the healthy condition of the lungs, third, the patient recovered from the diarrhoeal trouble, fourth, he has no fever, fifth, peritoneal exudate, if inflammatory, has a specific gravity of 1.018 or more, and contains albumin, 45 per cent or more If not inflammatory, it has a specific gravity of 1.015 or less, and contains albumin, 25 per cent or less Sixty ounces of fluid were withdrawn from the patient's abdomen It had a specific gravity of 1.009, and contained albumin, 08 per cent

"Splenic anæmia," so called, is scarcely regarded as a pathological entity It is an obscure condition about which we know little In this disease the spleen is greatly enlarged, firm, smooth, and commonly tender The enlargement is usually progressive

There is no other glandular enlargement There is progressive dyspnoea and muscular weakness very much as in pernicious anæmia Hemorrhages from the gastro-intestinal tract, repeated at intervals, are characteristic Between these attacks the health may be good When the disease has existed for a long while the liver may show a secondary cirrhosis This is the condition known as "Banti's disease" Hemorrhage often occurs before any change has taken place in the liver and is due apparently to mechanical obstruction of the venous circulation of the stomach in those areas which are drained by the splenic vein Ascites may be present

The following report by Dr Bliss indicates the condition of the blood at the first examination after the patient entered the hospital

Blood examination of J K, Douglas County Hospital—Red blood corpuscles, 2,120,000, white blood corpuscles, 4,000, hæmoglobin content, 40 per cent, color index, 1 minus, polymorphonuclears, 70 per cent, small lymphocytes, 23 per cent, large lymphocytes, 4 per cent, large mononuclears, none, transition cells, 2 per cent; eosinophiles, 1 per cent, some poikilocytosis, no nucleated reds, no plasmodia malarie

Dr Milroy, in summing up his examination, was rather inclined to the theory that we had to deal with a cirrhosis of the liver with malaria rather than to the theory of a splenic anæmia with malaria

My own impression was that a pernicious anæmia having been excluded it was rather splitting hairs in giving a name to the pathology, its nearest symptom-complex corresponding in my opinion to Banti's disease it filled to the letter Senator's definition of Banti's disease, viz, "Splenic anæmia with ascites, without local evidence of a general and otherwise positive tuberculosis" Urobilin was not found in the urine,—this is important when positive, but it does not negative the diagnosis of Banti's disease

Medical treatment having failed and as the man was suffering from pain and despondency, I recommended splenectomy, which was accepted and carried out February 28, 1907 The operation was difficult because of adhesions, and there was considerable hemorrhage The pedicle was secured in separate catgut ligatures The liver was smaller and paler than commonly

observed during operations upon other viscera, the intestines appeared normal. Shock was extreme, and active painstaking measures were demanded to overcome it. These efforts included hypodermoclysis, hot salt solution enemas, strychnine hypodermically, etc. The patient reacted and was progressing fairly favorably when, on the morning of the eighth day following the operation, there developed the usual symptoms of an acute inflammatory intra-abdominal lesion in the right lower quadrant, and I operated upon the man the same night for a supposed acute perforative appendicitis,—the symptoms seemed classical. Upon opening the abdomen through the usual incision of the right rectus muscle, the diagnosis of appendicitis was proven a mistake. Instead the following conditions were presented: there was a large amount of bad-smelling turbulent fluid in the abdominal cavity. The sigmoid flexure had become displaced to the right and fixed, besides it was very œdematous. On its right mesenteric border there was a dime-sized perforation through which a thin feculent discharge was escaping, and in addition there were two sphacelated spots distal to the perforation, about the size of a nickel each, which were about to perforate. The perforation and the necrotic spots were on the same line extending for three inches parallel to the mesenteric border and about one-half inch distant from it. Because of the œdematous condition of the bowel it was impossible to make a secure invagination of the necrotic line, any tension causing the stitches to tear out. The technic employed was to fold in the necrotic line as well as possible by means of a double button-hole stitch, and then tack an omental flap over the area involved. The cæcum, and its appendage, was in the same œdematous condition as was the sigmoid, and the rectum was so œdematous that it practically filled the pelvis. None of the small intestine was observed. After thorough irrigation, the lower peritoneal cavity was sponged as dry as possible and local and pelvic tubular drainage established. The œdema of the lower sigmoid and rectum was so great that difficulty was encountered in introducing the rubber drainage-tube between it and the empty bladder, into the pelvis. The man was placed in Fowler's position. To the astonishment of all interested, the relief of the intra-abdominal tension following the incision and the establishment of drainage, stopped the gangrenous process in the sigmoid, and admitted of repair to the

extent of preventing further intestinal leakage into the peritoneal cavity. A fecal fistula formed. The postoperative history shows that for days and weeks the man's life was in jeopardy because of a persistent diarrhoea and our inability to nourish him. Gradually, however, improvement began, and to-day he is able to get about, walk down town, and is gaining in weight. Occasionally there is a discharge from a knitting-needle sized fistula which I have not thought it prudent to operate upon. In addition to the giving of tonics he has taken the extracts of spleen and bone marrow. Last fall (after a visit to Dr. Crile) I filled the patient's blood vessels with good healthy blood by direct transfusion. The transfusion operation was apparently not of any particular benefit.

The case I have outlined represents typically a thrombosis of the splenic vein, the thrombus occluding to a lesser degree the superior and to a greater degree the inferior mesenteric veins, the arteries not being occluded. Moist gangrene of the sigmoid resulting. It is without doubt somewhat analogous to the case reported by Delatour in his paper entitled "Thrombosis of the mesenteric veins as a cause of death after splenectomy," published in THE ANNALS OF SURGERY, 1895. His patient died from thrombosis of the superior mesenteric vessels and a thrombus was also found in the splenic vein. A rotation of the spleen upon its axis had occurred before operation and besides Delatour questions whether or no the ligation of the pedicle *en masse* may not have had something to do with the formation of the thrombus in the splenic vein and its extension into the superior mesenteric vein, the nearer the ligature the firmer the clot was found to be. Edens, in the "Mittheilungen aus den Grenzgebieten der Medizin und Chirurgie," Achtzehnter Band, Heft 1, 1907, reports a case of thrombosis in the splenic veins in a fatal case of a symptomatic Banti's disease. The splenic vein was very tortuous, the lumen widened, and in many branches were found fresh and older thrombotic masses. Microscopically a section of the ✓ spleen showed marked dilatation of the splenic vessels, in many places the elastic tissue of the arterial wall being entirely

broken through and thrombi being forced into the spleen pulp. In all branches of the splenic vein Edens found evidence of an endophlebitis and concluded that the thrombus formation outside of the spleen was due to changes within the spleen itself. On the other hand a section of the spleen from my case shows marked thickening of the fibrous capsule and considerably more stroma than normal in the trabeculae. Other than a slight degeneration of the lymphoid cells of the pulp and a disintegration of the blood corpuscles in various areas, the spleen pulp is normal. There is no change in the blood vessels other than a slight thickening of the arterial walls and I find no evidence of either arterial or venous thrombosis.

These findings of the condition of the splenic blood vessels prove conclusively that the postoperative thrombosis of the splenic vein can hardly be considered from another standpoint than due to the traumatism of the splenectomy. In a study of the causes of death following splenectomy we find many cases reported as from peritonitis, and although I have no positive evidence in support of the theory that in some of these the peritonitis may have resulted from a thrombosis of the mesenteric vein secondary to a thrombosis of the splenic vein, yet when we consider Delatour's case and my own its occasional occurrence must be conceded.

The famous case of Elliott, reported in *ANNALS OF SURGERY*, 1895, in which he resected successfully forty inches of the small bowel for thrombosis of the superior mesenteric artery, has never been free from the suspicion that its origin was traumatic.

The writings of Broca and Schnitzler upon immediate and early enterorrhagias, those of Ullman upon late hemorrhages, and of Kukula upon the complexity of the causes of both types, are well known and all are really based upon the experimental work of Litten.

In the case just reported, the thrombosis was evidently traumatic and possibly with more gentleness in the handling of the pedicle preventable just as I believe most cases of post-operative gastric and intestinal hemorrhages are due to either

venous or retrograde arterial thrombosis, and result from the trauma of the operation. A localized arteriosclerosis of the gastric or intestinal blood vessels has been demonstrated. In such subjects, and in those suffering from endocarditis, a thrombosis with hemorrhage and a possible perforation can come about independently of the trauma of an operation.

An exhaustive study of the literature of splenectomy by those in a position to carry out this research for me has failed to find reported a single case of œdema with gangrene of the *large intestine* following splenectomy. And I do not recall ever reading of gangrene of the *large intestine* resulting from a thrombosis of the superior mesenteric artery or vein,—it has always been the small bowel. From the favorable termination of my case it would therefore appear, as before stated, that the thrombosis must have been limited to the splenic vein and occluded in part only the mouths of both the superior and inferior mesenteric veins, chiefly the latter.

# STONE IN THE BLADDER ASSOCIATED WITH INTERMITTENT PNEUMATURIA FOR THREE YEARS, AND THE SUBSEQUENT FORMATION OF FECAL FISTULA.'

BY ALGERNON T. BRISTOW, M D ,

OF BROOKLYN, N Y

Clinical Professor of Surgery in the Long Island Hospital Medical College

THE phenomenon of pneumaturia seems to be more common than a perusal of works on general or special surgery would lead us to expect. The writer has been unable to find any mention of the subject in the standard works with the exception of Kelly's volume on Appendicitis, in which he cites two cases of pneumaturia occurring as a sequel and complication of the disease. In one of these cases (Muhsam's) following a third relapse, the appendix ruptured into the bladder. As a sequel large quantities of gas were expelled with the urine, together with much pus. At the operation, the appendix was released from its adhesions, but no point of perforation could be found. The cystitis which had occurred as a result of the infection of the bladder from the intestinal tract, persisted for two months, when it subsided and for a time the patient appeared to be well; but after an interval the urine became turbid again and was found to contain plant cells and undigested animal fibres. About a year after the first operation a median incision was made and a connection between the cæcum and bladder was found. The repair of the fistulous openings was followed by complete recovery.

Although little mention of pneumaturia is made in the text-books, a search of current literature shows that many cases have been reported in the last twenty-five years. In an article published by Kelly and MacCallum in the *Journal of the American Medical Association* for August 20, 1898, in the bibliography at the end of the article, 22 cases of pneu-

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\* Read before the American Surgical Association, May 5, 1908



maturia, due to the presence of gas-forming bacilli, in the genito-urinary tract, are cited, and 184 cases, due to fistulous communication between the intestinal tract and the bladder. It seems strange that, with such a wealth of literature on the subject, so little notice of this complication has been taken in the text-books. From the above statistics it will be seen that the vast majority of cases of pneumaturia are due to the establishment of a fistulous communication between the bladder and the bowel. Nevertheless, quite a number of cases of what one may term intrinsic pneumaturia have been reported, that is to say, originally within the urinary tract, and it is, therefore, of importance in those cases in which there is simply an escape of gas with the urinary stream, to determine whether the phenomenon is due to the formation of gas in a suppurating kidney—one case of which was reported in the article above mentioned—or to the formation of gas in the bladder. When this latter phenomenon is present it is almost always due to the decomposition of diabetic urine, with the consequent formation of carbon dioxide and alcohol. To distinguish between these different conditions is very simple, as for instance in Kelly's case, in which numerous bubbles of gas, with a discharge of pus, were seen to escape from the left ureter. Operation in this case disclosed a suppurating kidney which contained quantities of gas. The bacteriological examination, however, failed to isolate the organism which was responsible for the pneumaturia. If the pneumaturia originates within the bladder, incubation of the urine in a fermentation tube will prove that the urine itself is the source of the gas. On the other hand, the case which the writer desires to report illustrates the fact that it is possible for the fistulous communication between the bowel and bladder to be so narrow as to permit the escape of gas from the bowel, but without the appearance of feces in the urine and without the occurrence of cystitis, thus to simulate an intrinsic pneumaturia.

The history of this case covers nine years and is as follows

A gentleman, thirty years of age, consulted the writer in December, 1903, and stated that four years previous he had been seized with a severe pain in the right side of the abdomen. This soon became intense, and was associated with distention and muscular spasms, so that the physician who was in attendance suspected an attack of appendicitis. It was finally, however, pronounced to be a right ureteral colic, with reflex abdominal symptoms. From that time until August, 1903, the patient remained perfectly well. Then a brick-red sediment appeared in the urine, which later became clouded. The patient also passed from time to time what he described as pieces of flesh. On two occasions his urine was extremely offensive, the odor being described as resembling the odor of asparagus urine or urine which was very stale. Late in August, while urinating, the patient was seized with a very severe pain, and took to his bed for two days, during this period every act of urination was painful, but the severity decreased, till, by the third day, the pain had disappeared. The urine was examined at this time by competent pathologists, and was found to be acid in reaction, containing urates and phosphates, but neither bladder epithelium nor pus. The first week in October he began to pass small quantities of blood at the end of urination. He also had three attacks of vesical spasm, ten days apart, each attack lasting for about a day. The urine now contained pus and blood, but continued to be of acid reaction. The attacks of pain ceased, and the patient resumed his business, travelling by rail twenty-five miles a day to the city and returning at night, without inconvenience. he was also able to play golf. Late in November, the patient noticed that the stream of urine was interrupted by bubbles of gas, this was of daily occurrence for about six weeks. It was invariably with the morning urination, and on one occasion the noise of the sputtering urine was heard in an adjoining room. In December the pain returned with some severity, also, the bleeding, which became more profuse. The patient was now brought to the city by his brother, a physician, and seen by the writer. On examination the right iliac fossa was quite tender on palpation, although no mass could be made out, nor anything resembling an inflamed appendix. The evening temperature was  $102^{\circ}$ , but fell to normal, from which it rarely deviated. Besides the tenderness, the patient also complained of pain in the same locality. Deep massage along the

right ureter was made, but no colon ferment could be detected. The day following this examination, the patient brought to the writer two long ureteral casts, which, when first seen, much resembled lumbricoid worms, they were in alcohol, however, and the patient said that they were bright red when first passed, closer examination showed them to be blood clots decolorized in the alcohol. After the passage of these casts, the right-sided pain ceased, as did the tenderness, but the pain on urination continued. Rectal examination disclosed a slightly enlarged prostate, which was, moreover, exceedingly tender. Some pus appeared in the urethra after massage of the prostate, but microscopic examination of this failed to show any specific organism, and the patient was absolutely without any venereal history. The urine now showed pus in large quantities and blood, but remained acid in reaction. As an uncle of the patient had died of tuberculosis, it seemed wise to exclude the possibility of a tuberculosis of bladder or kidney by inoculation tests before introducing any instrument into the bladder in order to avoid the possibility of a secondary infection. A guinea-pig was therefore inoculated with a small portion of centrifuged urine and killed at the end of six weeks. Examination of the peritoneum was negative, but caseous bronchial glands were found, these, when examined, were negative. A second inoculation gave entirely negative results, and tuberculosis of the genito-urinary tract was therefore excluded. The patient had, meanwhile, been improving rapidly, the blood and pus had disappeared from the urine, and the pneumaturia had ceased, he had also gained ten pounds in weight. A Thompson searcher passed into the bladder immediately disclosed a small stone, about the size of a chestnut. It was evident, however, that two symptoms still remained unaccounted for: the ureteral casts, and the pneumaturia. In order to settle the question as to whether the gas was formed by the urine itself, owing to the presence of some gas-producing bacillus in the bladder or kidney, it was, on several occasions, put into a fermentation tube, and allowed to remain in an incubator for twenty-four hours, but always with negative results. Up to this time, also, all examinations for the colon bacillus, whether by culture or smear, had been fruitless. Cystoscopy and radiography were now invoked for the purpose of determining if possible by the cystoscope whether there was any appearance in the bladder

suggesting a fistulous tract communicating with the appendix or bowel, by a radiogram, whether there was a stone in the kidney or ureter as well as in the bladder. The stone in the bladder was clearly seen by the cystoscope in the hands of Dr Tilden Brown of New York, but nothing else abnormal was discovered in the bladder wall, which was pale, and, considering the presence of the stone, singularly free from all evidences of irritation. A radiogram clearly showed the stone in the bladder, but no evidences of calculus on the right side either in kidney or ureter. A small shadow appeared on the plate, however, low down on the left side of the pelvis, near what would have been the vesical end of the *left* ureter. This was thought to be an artefact, as the patient had never had any pain in the left side. The ureters were not catheterized at this time. The writer now determined to remove the vesical calculus by suprapubic cystotomy and to carefully inspect the bladder for any evidence of fistula. The operation was brief, the bladder was dilated with air, after the writer's method, the small stone was removed, no evidence of a fistulous opening being discovered the bladder wound was closed by suture, as was the skin incision, with the exception of a small drain at the lower angle of the wound to provide against leakage. The catheter à demeure was removed on the third day, and the patient left the hospital on the tenth day for his home. For six months he remained perfectly well, when he had a brief return of the pneumaturia for forty-eight hours, the gas escaping not with every urination in that interval, but two or three times each day. No pain. The pneumaturia then ceased. Once, during October of 1904—eight months after operation—the patient had an attack of pain in the right iliac region, and late in November, while at Lakewood, a similar attack. During the October attack, the patient had some tenderness in the iliac fossa, without fever or muscular spasm. With the pneumaturia and following it, pus reappeared in the urine, after a short interval, however, again disappearing. From November, 1904, until October, 1905, a period of eleven months, the patient remained perfectly well, taking a trip to Europe in the summer of 1905. A letter received from the patient in October, 1905, may be condensed as follows: "Trip to Europe, June 28, returned September 1 without an hour's illness, gained ten pounds in weight." Four days after return, while playing bridge one night, was

seized with severe pain in the right side and had to be helped upstairs Had a severe chill and intense pain all night On the third day, however, was able to get up and be about Pain ceased entirely with the exception of a severe pain which comes at the end of the penis on urinating and continues for about half an hour afterwards Urine was stringy with pus and two weeks after blood appeared again in the urine Patient lost eight pounds in this illness, during which he was not seen by the writer Patient wrote that he thought that a stone might have passed from the kidney to the bladder, the attack having been brought on by playing golf, he also stated that one night he knew, when urinating, that he was going to pass gas with urine, and actually did so The patient, on recovery from this attack early in November, was taken to Dr Tilden Brown, of New York, for ureteral catheterization, urine collected from both ureters and from the bladder, found to contain the colon bacillus and pus in microscopic quantities A styletted ureteral catheter introduced into the left ureter showed that the small shadow which had appeared uniformly in all the several plates which had been taken was neither in the ureter nor close to it, pus could not be seen in visible quantities issuing from either ureter, and the urine was now clear The patient had a moderate organic lesion of the heart, and his business affairs were in such a position that he was unwilling to submit to exploratory laparotomy, unless he was clearly in danger of his life In January, 1906, he had another attack similar to that in October, with chills, high fever, and right-sided pain, this illness lasted ten days, patient passed some gas again, was not seen by the writer, owing to his residence in another city In May, he went to Europe and, landing at the Azores, took a gallop on a donkey and that day passed gas in quantities, but without pain, this was on May 17 The pneumaturia ceased in two days On June 18 while in Venice, and after ten days of rest, the patient had a severe pain at the end of the penis after which he passed a quantity of blood and pus No pneumaturia nor pain in the abdomen This attack was described as one of the sharpest attacks which had happened On July 4 after a violent game of shuffleboard, patient passed gas again, but had no pain On January 29, 1907, the patient writes that he felt an attack coming on, "with a kind of bearing down pain in the whole lower part of the abdomen", for the first

time no pain transmitted to the penis, nor was there any spot on any part of the abdomen which was specially painful, abdomen sore all over. There was no rise of temperature, but more pus came each time the patient urinated, passed gas, however, with a rush, urine was pretty clear in the day-time, but thick with pus every morning. An examination of the urine passed at this time showed some vegetable fibres, and it became perfectly evident that at some point there was a communication between the intestine and the genito-urinary tract.

From that time to the present, the history of the case has been entirely clear, as a fecal fistula definitely established itself, the orifice of which can be seen by the cystoscope, about one inch above the right ureter. At present, the amount of fecal material is much less than it was a month or two ago. Recently the patient sent to the writer a small vial of urine which contained shad roe, with a note to the effect that he had eaten the roe at 5 P.M., and that it had appeared in the urine discharged at 11 P.M. of the same evening. A noteworthy fact connected with this remarkable case appears to be the extraordinary tolerance of the bladder. So far as is known to the writer, all cases of vesico-enteric fistula have been characterized by a furious cystitis. Nothing of the sort inconveniences the patient, his urine continues to be acid, and he apparently suffers no inconvenience from the fistula. In January he had some symptoms indicating a pyelitis of the left kidney, but these rapidly subsided after a day or two. Although warned of the certainty of an ultimate double pyelonephritis, for the present the patient absolutely declines an operation, because he feels perfectly well. In fact, he goes to business every day and has put on weight.

As one reviews the complete history of this case, now that all the clues are unravelled, the diagnosis seems to be sufficiently plain. An attack of appendicitis nine years ago, mistaken for renal colic, during which the appendix became attached to the bladder, then an interval of quiet for four years, followed by the establishment of a long, narrow fistulous tract between bladder and colon by way of an almost obliterated appendix, the formation of a stone about a tiny particle of slough, which marked the establishment of the fistula, the

closure of the tract for long periods, perhaps by mild inflammatory processes, the recrudescence of the trouble about the region of the appendix, at long intervals, finally the establishment of a permanent fistula. But this does not explain the ureteral clots, and it is within the bounds of possibility that the stone in the bladder was originally of renal origin. The case cannot be entirely cleared up until the patient submits to operation.

A number of cases of pneumaturia from vesico-enteric fistulæ have been reported in women. These have usually been the result of pelvic peritonitis, during which the bowel has become attached to the bladder, the fistula following as a result of direct infection from the damaged bowel to the attached bladder wall.

To sum up. Pneumaturia may be intrinsic, that is, originating entirely within the urinary tract, or extrinsic, in which it is due to communication between the urinary tract and the intestines. In the intrinsic cases, we must distinguish between those cases in which the pneumaturia originates within the cavity of a suppurating kidney and is due to a secondary infection by one of the gas-producing bacilli, and the more common cases, where a diabetic urine is decomposed within the bladder itself into  $\text{CO}_2$  and alcohol. The former condition is curable by surgery, and the cystoscope of course offers the means of diagnosis, as in Kelly's case. When the pneumaturia is extrinsic in origin, we must distinguish between those cases inflammatory in origin, which are curable by operation, and those which are due to the eroding process of a carcinoma in the pelvis which has opened up a communication between intestine and bladder. With regard to the inflammatory cases, the only difficulty will be in determining the point of communication between the urinary tract and the bowel. This might be as high up as the transverse colon, or duodenum communicating with the renal pelvis or at some point on the ureter itself, or into the bladder. At one time, in the case which has been narrated, it seemed possible that a stone in the ureter might have ulcerated and

made a communication between bowel and ureter; such a hypothesis explains some of the symptoms. When the fistula has been between rectum and bladder (of which some instances have been reported) milk injected into the rectum promptly appeared in the urine. Methyl blue has also been used, but seems open to the objection that after an interval it would appear in the urine without the existence of a fistula, from absorption alone. The administration of bismuth, and a subsequent radiogram, might possibly be of help. Authors seem to be divided as to the chemical composition of the gas in these cases of pneumaturia.  $\text{H}_2\text{S}$  is readily soluble in water, so we should not expect this gas to be expelled as a gas but rather in solution. In fact, a number of cases of hydrothionuria have been reported. Scott has an article in the *New York Medical Journal*, June 17, 1893, in which he reports four cases—three of which were post partum, and one followed a laparotomy for pus tube. One woman furnished two cases, the hydrothionuria occurring after two successive labors twenty months apart. The odor of sulphuretted hydrogen was overpowering in these cases, but there was no pneumaturia. Chemical tests of the urine proved the diagnosis. It does not seem likely that  $\text{H}_2\text{S}$  would escape solution in the urine. In fact, in an article by Friedrich Muller, *Berliner klinische Wochenschrift*, October, 1889, No. 41, the analysis of gas in a number of cases of pneumaturia showed a preponderance of nitrogen, next in quantity being hydrogen and  $\text{CO}_2$ . A trace of  $\text{H}_2\text{S}$  was found by Ruge. The article is commended to those who are interested in the chemical composition of the gas expelled in such cases.



# RESULTS OF OPERATION ON THE KIDNEY FOR CALCULUS AND TUBERCULOSIS \*

BY ANDREW J McCOSH, M D,

OF NEW YORK,

Surgeon to the Presbyterian Hospital

THE final outcome of operations is of wider interest than the immediate results. The object of the paper is to trace first the future life history of patients from whom in past years a tuberculous kidney had been removed. Definite figures as to the prognosis of these patients without operation were difficult to obtain. Easier to reach were the results which follow nephrectomy for this condition. In many cases decision as to the necessity for operation was very difficult. Most surgeons believe that functional restoration of the kidney which had once been the seat of tuberculosis was exceedingly rare. The writer believed, however, that under proper hygienic and climatic conditions it is possible, and related the history of such a case.

In his experience he had performed fifty-four nephrectomies, nineteen having been done for tuberculosis. There were no fatalities due to shock. Two patients died within a few weeks after operation. Eight patients died at periods of from one to three years after operation. Five patients have made a perfect recovery, and now enjoy excellent health at periods varying from six to nineteen years after operation. In three hundred and thirty cases of nephrectomy which he had collected there were about 20 per cent of permanent cures.

*Calculi*—He had performed forty-five operations for renal calculi. In this paper the septic kidneys, or those in a condition of pyonephrosis process were excluded from consideration. Fifteen nephrolithotomies had been performed by him. Twelve of these patients were perfectly well at the present time. It was a question with him whether the stone should be extracted through an incision in the parenchyma of the kidney or through one made in the renal pelvis. He had never been inconvenienced

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\* Author's abstract of paper read before the American Surgical Association, May 5, 1908

by excessive hemorrhage and he was inclined to prefer the extraction of the stone through the kidney, rather than by an incision in its pelvis

While these cases are not sufficiently numerous to throw much light on this question, yet it is suggestive that in five patients where the incision was made in the pelvis, leakage occurred in four. In six patients where the incision was made through the kidney itself, leakage occurred in one only. It is not quite fair, however, to judge from these figures that leakage of urine is less apt to follow incisions in the kidney than those in the pelvis, because in several patients the wound in the pelvis was but lightly sutured in anticipation of future need of external drainage, whereas the wound in the kidney was always thoroughly closed by suture. It is my impression, however, that there is less danger of leakage when the stone is extracted through the parenchyma of the kidney.

In the majority of patients with nephritic calculi either the pyelitis is so severe or the kidney itself is in such a state of advanced pyonephrosis that all question of closure of the kidney is at once settled. External drainage is necessary. There are, on the other hand, patients in whom the kidney itself appears comparatively normal and where the pyelitis is comparatively slight. Drainage seems, under such conditions, to be quite unnecessary. We will always, however, encounter a few cases where it will not be easy to decide whether or not to employ drainage. In all cases we must be sure that the ureter is patent. Drainage is indicated if there be any sign of disorganization of the kidney itself, if the calyces be much distended, if the urine should have been loaded with pus prior to the operation, if there should have been at any time fever or signs of sepsis, if much damage has been done to the kidney during the extraction of the calculus, and if there should have been crumbling of the calculus during the process of its extraction,—as under these circumstances some small fragments might have been left behind in the calyces. Should there be doubt as to the wisest method of procedure, a compromise may be made and the kidney very lightly sutured with fine (00) catgut. Should the inflammation of the pelvis be so severe as to demand drainage, nature will come to its relief and burst open the sutured kidney, as occurred in one of my cases.

# STONE, TUBERCULOSIS OF THE KIDNEY AND PERINEPHRIC ABSCESS \*

BY GEORGE TULLY VAUGHAN, M D,

OF WASHINGTON, D C.,

Professor of Surgery in Georgetown University

STONE may exist in the kidney or ureter without infection and infection may exist without stone, but both are often found together. The causes of stone are heredity, loss of balance between ingestion and assimilation, and sudden chilling of the body, leading to deposit of the urinary salts which are held together by the colloid material provided by the products of inflammation,—pus, blood, or mucus.

The *symptoms* of stone in the kidney are due to infection or the mechanical action of the stone, the most reliable being pain, renal colic, blood, pus, or gravel in the urine, and oliguria or suppression of urine.

Pain, aggravated by motion, is felt in the lumbar region and may extend along the ureter to the bladder, penis, testicle, thigh, foot, or may be referred to the sound kidney. Palpation or percussion over the kidney may cause pain. Renal colic may end in the stone passing into the bladder, dropping back into the kidney, or becoming impacted in the ureter—the point of impaction being indicated at times by pain and tenderness. Statistics indicate that the most common sites of impaction are, in order of frequency, the juxtavesical, the juxtapelvic, and the portion just above the brim of the pelvis. The cystoscope and Röntgen ray are of great value in making the diagnosis.

Phloridzin and cryoscopy may be used to test the functional activity of the kidneys. Casper injects one gram of phloridzin under the skin. This produces diabetes, lasting about 3 hours, and if one kidney is disabled by stone, tuberculosis, or other cause, the urine from that kidney contains a smaller quantity of sugar than urine from the other or healthy kidney. Also, cryoscopy shows that the urine from the disabled kidney contains less

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\* Author's abstract of paper read before the American Surgical Association, May 5, 1908

solid matter and therefore freezes at a higher temperature (less degree of cold) than the urine from the healthy kidney

TUBERCULOSIS OF THE KIDNEY is in the majority of cases secondary to tuberculous foci in other parts of the body, it is primary in about 15 per cent of cases, it is often unilateral and is usually of hæmatogenous origin. Rarely it is secondary to tuberculosis of the bladder. Trauma, stone, gonorrhœa, and other inflammations predispose to it. The disease is more common in women between the ages of 20 to 45 and the ureter is affected in 10 to 15 per cent of cases.

*Urinary Symptoms*—Polyuria in the earliest stage, then blood and pus, are found in the urine—the former usually in small quantity and intermittent, the latter usually early, constant, and abundant

*Vesical Symptoms*—Painful and frequent micturition with tenesmus, varying in degree and frequency. Injection of the bladder or ulcers may be seen by the cystoscope

*Renal Symptoms*—Usually pain and tenderness in the kidney and enlargement on palpation

*General Symptoms*—These are chills, fever, sweats, emaciation, vomiting and uræmia

PERINEPHRIC ABSCESS is the result of infection of the tissues immediately surrounding the kidney and is generally secondary to infection of the kidney or some more distant organ, as the appendix, gall-bladder, lung, pleura, intestines or bones

The symptoms are often obscured by those of the primary disease, but the most common are pain, tenderness, chill, fever, sweats and a palpable mass in the region of the kidney. The pus may break into other organs or point externally in Petit's triangle

*Treatment*—Stone in the kidney should be removed at once (the best time is before infection occurs), impacted stone in the ureter, as soon as it is evident that it will not pass. A calculous kidney should not be removed as long as there is any chance of saving it, even if repeated operations are necessary

Tuberculosis limited to one kidney should be treated by nephrectomy. If both are affected, nephrostomy and drainage are advisable. The best incision for nephrectomy or nephrostomy is the Morris or oblique incision just below the last rib

## ILLUSTRATIVE CASES

CASE I—*Patent urachus, stones in both kidneys—requiring four operations*

This patient was operated on as follows First operation, June, 1904, patent urachus excised, second operation, August, 1904, stone removed from right kidney, third operation, May, 1905, two stones removed from left kidney, fourth operation, December, 1906, coral stone removed from left kidney

The patient now (April, 1908) seems to be in perfect health

CASE II—*Enormous stone in the juxtavesical, and a small stone in the vesical, portion of the right ureter, large perinephric abscess draining into ureter*

The patient, a woman 33 years old, had suffered from renal colic on the right side which soon subsided into a constant pain with exacerbations at intervals Other symptoms were chills, fever, frequent micturition, hæmaturia, pyuria, and tenderness over the right kidney and right iliac region By vaginal examination a hard mass about as large as a hen's egg could be felt anterior and to the right of the uterine cervix It was diagnosed as a stone in the ureter and was removed by incision through the vagina and ureter The stone was whitish in color, irregularly spindle-shaped, measured 7 cm ( $2\frac{3}{4}$  in) in length,  $11\frac{1}{2}$  cm ( $4\frac{1}{2}$  in) in circumference, and weighed 61 grams (915 grains)—the largest stone I have ever heard of having been found in the ureter

Three weeks later a large perinephric abscess was opened It was situated above and behind the kidney, which it had displaced downward The abscess communicated with the ureter but did not communicate with the kidney so far as could be ascertained by careful examination of the kidney within and without

CASE III—*Pyelonephritis of left kidney and pyelitis of the right—probably of gonorrhæal origin, nephrectomy of left and drainage of right kidney*

A man, 26 years old, had pain, vesical tenderness, frequent micturition and pyuria ever since an attack of gonorrhœa 4 years previous The symptoms pointed to the left side chiefly The left kidney was exposed, found to be a pus sac and was removed

with the ureter as far as the brim of the pelvis, the end of the ureter being stitched to the skin in inguinal region. Improvement followed, but 18 months later nephrostomy and drainage of the remaining kidney was done for six weeks. Great improvement followed and the patient regained his normal weight and returned to work after 2 years in hospital, but there is still pyuria.

## NEPHROLITHIASIS †

REPORT OF A CASE IN WHICH A RENAL CALCULUS WEIGHING ONE POUND AND TWO DRACHMS WAS SUCCESSFULLY REMOVED

BY DAVID BARROW, M D.,

OF LEXINGTON, KY

THE kidney stone of the present report is of interest mainly on account of its size Just after removal it weighed one pound and two drachms It is the largest I have seen, and I am able to find but one reported as large, removed by operation (that described by Shields in the *Lancet*, October 15, 1904, which weighed 570 Gms ), although my search of the literature has not been exhaustive In the St Bartholomew Hospital Museum there is a stone, removed after death, which weighs  $36\frac{1}{2}$  ounces It was taken from the right kidney, and from the left another was taken that weighed  $9\frac{3}{4}$  ounces The largest removed by Morris during life weighed 10 ounces, and he had made about one hundred operations for renal calculi up to 1898

From a small piece of the stone Dr Louis Heitzmann made the following report "Was of a grayish-white color, brittle in character and indistinctly lamellated Under the microscope it was found to consist of variously sized plates of triple phosphates, that is, ammonio-magnesian phosphates, as well as of simple, or calcium, phosphates, alternating with each other Chemically it dissolved upon being treated with hydrochloric acid without effervescence The nucleus of the stone was identical in structure with the body and the periphery The diagnosis is phosphatic calculus "

Wishing to preserve the specimen intact, the interior of the stone has not been examined, so I do not know the primary deposit, but beginning, as the history indicates, in early life, it seems probable that it is uric acid The piece examined by

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Dr Heitzmann was peripheral and its composition throughout was identical, but the interior of that piece does not represent the nucleus of the main stone. With the primary uric acid deposit in time infection occurred, causing the secondary phosphatic deposits.

Mr D. J. W., aged 48, a patient of Dr F. M. Greene, of Lexington, Kentucky, consulted me in November, 1905. He stated that he had never been strong, that at the age of eight he had had the first symptoms of some abdominal trouble, and that since, for forty years, he had never felt well longer than a few months at a time. During boyhood he averaged three or four attacks a year, described the pain as being intense, in the region of the left kidney and lasting usually several days, always leaving the side sore and tender. At the age of fourteen, contracted "chills and fever," the type being irregular, which continued for one year, and were never controlled by quinine. After the chills and fever he improved in a general way, although he continued to have abdominal attacks every few months and was never strong or felt perfectly well. At the age of twenty, urinary symptoms appeared, and during the abdominal attacks he had to void urine as often as every half hour, at other times not so often, but always too frequently. Urination sometimes was quite painful, the urine often having a muddy appearance and causing an intense burning in the penis. For ten years the symptoms continued without much change, the abdominal attacks being slightly more frequent. During this period he was unable to attend to his duties (those of a farmer), except in a most indifferent way, and was never able to do hard manual labor without causing a return of the pain. At about thirty the attacks began to be more frequent, often recurring in a month, and in the intervals there was more abdominal soreness, greater weakness and more discomfort in getting about, and the urinary disturbance was nearly always present. A number of physicians had been consulted and had varied opinions as to the trouble, but strange to say, no one seemed to consider the kidney at fault, or at least, did not tell the patient so. He was given a great deal of medicine, and occasionally suffered so intensely that opiates had to be administered, but never to the extent of producing the habit. Ten years before consulting me, at the age of thirty-eight, he noticed for the first time an enlarge-



ment in the left abdominal cavity just below the ribs, it was round and about the size of an orange, and not very sensitive to manipulation. For these ten years he gradually lost ground, got very thin, suffered more pain, had more evidence of sepsis, urinary discomfort became almost continuous, and the tumor increased in size slowly. For four years he was practically an invalid, unable to do any work on the farm, was confined to bed much of the time, and was being treated by the X-rays, with the belief that the abdominal tumor was an enlarged spleen. He consulted me first at my office, and the following observations were made.

He was 5 feet 8 inches tall, weighed 120 pounds, his expression was anxious, complexion sallow, and there was every appearance of long suffering and ill health. He looked markedly septic, and told me that he had slight fever in the evenings, his pulse was over 100, and he suffered with short breath on slight exertion. An examination of the chest organs revealed nothing abnormal. In the abdominal cavity, to the left of the umbilicus and extending up to and under the border of the ribs, was a hard, oval tumor, about the size of a cocoanut. It was firmly fixed and was not affected by respiration, and there was but little pain on palpation. His bowels acted regularly, and at no time had he had any obstructive symptoms, the movements seemed normal and had never contained blood, but occasionally there was gaseous distention. The urine was normal in quantity, alkaline, and contained a large amount of pus and phosphatic debris, urination was frequent and painful, and a number of examinations for tubercle bacilli proved negative. There was no enlargement or tenderness of the right kidney, and at no time had there been any pain in the right side, an exploration of the bladder proved negative. There was no blood in the urine, and there was no history of ever having passed any. A diagnosis of pyonephrosis, probably of calculous origin, was made. He was sent to St. Joseph's Hospital, and operated upon December 16, 1905. After etherization, resting upon a loin pillow, an oblique incision was made from near the twelfth rib along the outer border of the erector spinæ muscle, curving forward a little above the crest of the ileum and Poupart's ligament. The tumor was firmly fixed and closely adherent to the perirenal tissues which were hard and indurated, but was enucleated without great difficulty. The calculus occupied the pelvis, and as there was great destruction of

FIG. 1



Calculus  $4\frac{1}{2} \times 3\frac{1}{2}$  inches in dimensions weighing one pound and two ounces removed with the degenerated kidney



the parenchyma of the kidney, a nephrectomy was done. The pedicle was transfixed and doubly ligated with silk, the ureter was traced for about three inches, ligated with chromic catgut and divided, so there was no escape of pus or soiling of the wound. The incision was closed with plain and chromic catgut, each layer being sutured separately, a rubber drain was inserted. The patient was but little shocked by the operation, and left the table in fair condition. The secretion of the urine was abundant, it soon cleared up, and in a few days analysis showed it to be normal, confirming the opinion that the right kidney was in good condition. Convalescence was satisfactory, but the drainage tract was rather slow to heal, at no time, however, was there anything to cause special anxiety. In seven weeks after the operation he left the hospital, completely healed and gaining in every way rapidly. At this time, now more than two years, he weighs 152 pounds, seems perfectly well, and works every day on the farm.

# PRIMARY CARCINOMA OF THE FEMALE URETHRA \*

BY LEWIS S McMURTRY, M D,  
OF LOUISVILLE, KY

THE literature of the subject is meagre and there is an absence of any detailed consideration of the same in the standard text-books on surgery and gynæcology. In 1898 but two cases were to be found in the Index Catalogue of the Surgeon-General's Office at Washington. The first systematic study of the subject, with investigation of the literature, was made by Melville Wassermann and published in Paris in 1895. Of the twenty-four cases reported by this writer a large proportion had been excluded because of the fact that the disease was not primarily of the urethra, but had its origin in adjacent structures. In many of Wassermann's series the diagnosis was not confirmed by microscopic examination. The meagre and imperfect observations of the early reports upon the subject led Alexander Skene in his comparatively recent treatise on gynæcology to declare that the existence of cancerous disease of the female urethra is doubted by many authors.

The first thorough and painstaking investigation of this subject was made in 1903 by Dr J F Percy of Galesburg, Ill., and presented in a paper to the Chicago Gynæcological Society in that year. Dr Percy made an analysis of the entire literature of the subject, and examined the original reports of cases accessible at that date. Percy's table of all recorded cases up to 1903 consisted of sixteen cases of unquestionable primary carcinoma of the female urethra.

The writer has made a diligent search of the literature in the Surgeon-General's Office in Washington to the present time, and has added eleven cases to the list as recorded by Percy. The entire list to date consists of twenty-seven cases.

He states that from inquiry among operative surgeons while investigating this subject he is led to believe that many cases have

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\* Abstract of paper presented to the American Surgical Association, May 5, 1908

not been reported and that the disease is more common than the recorded list would indicate

The writer reported two cases in which he has operated in the last three years. In both cases the disease originated in the urethra. Both were treated by complete excision of the urethra down to the sphincter muscle of the bladder. In one case the growth returned during the first year after operation and rapidly extended to the base of the bladder, the perivesical tissues and inguinal glands. No further operation was permitted. In the second case the pathological process was in its incipiency, the urethra was excised as indicated, prompt healing followed with perfect control of the bladder, and the patient continues without recurrence at the present time, one year after operation. Photomicrographs, showing the histologic changes in both cases were exhibited.

The writer claims that early diagnosis of carcinoma of the urethra of the female is difficult, because of the resemblance of the initial lesion, both as to appearance and symptoms, to urethral caruncle, a very common benign growth. He also called attention to the difficulty of differential diagnosis from certain syphilitic lesions which obtain in the same location.

The prognosis and treatment are the same as for carcinoma in other parts of the body. The great desideratum for successful treatment is habitual examination of all cases applying to the physician with painful micturition, early diagnosis of malignant types of disease, with complete excision in that early stage of invasion when permanent cure is possible.

## PELVIC ABSCESS WITH SPECIAL REFERENCE TO RECTAL DRAINAGE.<sup>1</sup>

BY ARCHIBALD MacLAREN, M D,

OF ST PAUL, MINN

Professor of Clinical Surgery in the University of Minnesota

THE problem of how to deal with pus in the pelvis has been practically solved in so far as the woman is concerned, all intra-peritoneal collections of pus, with the exception of tubercular inflammations, whether from cellular tissue, appendages, uterus or appendix, can be cured by vaginal section, in the vast majority of cases

Experience drawn from histories of 210 pelvic abscesses treated by vaginal section, reported in the *St Paul Medical Journal* of Jan, 1908 Of this number 20 were recognized at the time of the original operation as due to suppurative perforative appendicitis and these were drained through the vagina and all temporarily cured by a simple vaginal section Further observation has been, that not more than 20 per cent of all pus cases, including pus-tubes and suppurating ovarian cysts, need more than a single vaginal section with the tube drainage and that at least five per cent of the pelvic abscess cases were so perfectly cured that they were able to conceive and bear children

In the pelvic abscess of men we have a slightly different problem, for here, to reach and drain Douglas' cul-de-sac we must go through the anterior rectal wall The fear of increasing the infection or of further contaminating the abscess cavity has until now prevented giving a man the same chance as the woman Many cases of pelvic appendiceal abscess in men and boys have been opened and drained in both sides, both loins, as well as having suprapubic stabs for large glass or metal tubes, and in spite of all these different drains have died of chronic sepsis or amyloid liver because the dependent portions of the peritoneum have not been drained We all know that if these abscesses be left to themselves a certain number will perforate into the rectum

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\* Abstract of paper read before the American Surgical Association,  
May 6, 1908

and cure themselves, if we take off the pressure in this abscess-cavity by opening it from above we lessen the chance of nature's best cure

These pelvic abscesses in males are practically all due to perforative appendicitis. If we might be fortunate enough to see and recognize all acute cases of appendicitis before rupture of the appendix this question of rectal drainage would not be so important. After rupture the omentum and adhesive peritonitis usually wall off the pus and keep it in the right loin. The edge of the pelvic cavity is, however, very near, and in many cases the pus runs over into the true pelvis at the time of the rupture. Many others extend into the true pelvic cavity in the next few hours or days. Examine through the rectum every case of acute appendicitis before any operation. It is very important that the pelvic accumulations should be drained with a suprapubic drain followed by Fowler's position, reserving rectal drainage for the cases who later develop pelvic accumulations or convalesce badly after any course of treatment. Five cases reported. First case a simple rectal puncture, abscess opened, discharged several ounces of pus. Closed too soon but later opened of itself, discharged. Cured. Second case overdistended the sphincter to prevent back pressure from the rectum into the abscess cavity, put in a winged rubber tube which extruded a couple of inches from the anus. Quick recovery. Third case opened base of bladder by mistake, put finger in bladder to be sure that it was the bladder, left it open, then opened cul-de-sac and put in tube, no bladder trouble, coughed up pus from ruptured subdiaphragmatic abscess. In six weeks from time of first operation discharged cured. Fourth case on tenth day found a bulging anterior rectal wall and made a rectal section, let out several ounces of thick offensive pus, showed considerable bleeding for several days, rise in temperature and pulse from blood infection, slow recovery. Fifth case, assisted Dr H P Ritchie to operate acute perforative appendicitis on third day after perforation, on tenth day Dr Ritchie put drain in rectum. Slow convalescence, ultimate perfect recovery. As will be noticed these cases are all of one type. I have advised them that they must come back later for removal of the appendix. There is another type which I have not operated upon, namely, the man who is desperately sick, and who presents a decided fulness in the cul-de-sac. In such a case



I will on my first opportunity simply open the cul-de-sac and drain and not make any anterior incision at all. Making the anterior incision later if necessary. I believe that this method will decrease the mortality of these abscess cases.

*Operative Procedure*—The exaggerated lithotomy position (Pryor), the one usually used in making cystoscopic examination of the female bladder. The most important part of this position is the use of straps over the shoulder fastened to the uprights holding the feet, to prevent the shoulders sliding away when the head of the table is dropped. I have found that a weighted vaginal speculum will expose the anterior wall of the rectum fully as well as is usually done in vaginal section. One long-bladed retractor for the anterior wall is necessary to hold the bladder out of the way. The bladder having been catheterized, to prevent accident, then irrigate the rectum until fecal matter is removed, then sponge it out with alcohol. After the rectum has been well cleaned and the bulging anterior wall well located open the abscess with either long dissecting forceps or a tenaculum and long sharp-pointed scissors. After opening the cul-de-sac and letting out fluid, keep the scissors in place until a dilator can be passed upon them as a guide, then keep the dilator in place until one can pass a  $\frac{1}{4}$  inch rubber winged tube well up into the cavity, then again dilate the sphincter.

Attention is called to a combination trocar and dilator for use in vaginal puncture, few blood vessels in vaginal section, but as shown in Case V, there is some danger of hemorrhage following rectal section. Vaginal section is blind, does not give sufficient room for further exploration. But in rectal, all that is necessary is an opening through which to pass a drainage-tube into the cul-de-sac of Douglas.

# TREATMENT OF FRACTURES OF THE FEMUR.<sup>\*</sup>

EXTENSION MADE FROM TRACTION BELOW THE KNEE OF THE INJURED, AND  
COUNTER-EXTENSION THROUGH A SIMILAR POSITION FROM THE  
IMMOBILIZED UNINJURED LIMB

BY OSCAR H. ALLIS, M.D.,

OF PHILADELPHIA,

Surgeon to the Presbyterian Hospital

FRACTURES were probably among the first accidents to demand sympathy and skill in the human race, and with this sympathy and skill constantly and universally in demand through all the centuries that have passed, it is hardly to be supposed that any new principle will ever be evolved. The most brilliant and modern of all, the open method, while it possesses all the advantages of exactitude and precision, is hardly likely, even with the assurance of absolute safety, ever to become the accepted method even in hospitals where its advantages can be most readily attained

One of the first and most obvious demands in fracture of the thigh-bone is a provision for continuous and prolonged recumbency, and for this purpose fracture-beds have been contrived. These beds have engrossed the attention and elicited the combined inventive genius of lay and professional minds until they supply almost every conceivable want and add greatly to the ease of nursing and comfort of the patient, and yet, strange as it may seem, there is scarcely a hospital in Christendom that has a fracture-bed. There are many good reasons for the surgeon's aversion to fracture-beds, but there are equally cogent reasons why they should be used and it would not surprise the writer to see them resume their place as a necessary adjunct to the surgeon's requirements

In fractures of the femur attention must always be directed to three untoward tendencies, viz, to rotation, angula-

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\* Read by title before the American Surgical Association May, 1903

tion, and shortening,—three serious defects, any one of which if pronounced is attended with crippling results, and for whose correction scores of ingenious apparatuses have been devised, but each in turn to be found untrustworthy and disappointing

Of the three tendencies to deformity, that of shortening has given the most trouble and has elicited the greatest skill. While the various appliances are legion, all the methods of extension can be arranged under two heads, in the first the two fragments are treated by different parts of the same apparatus, in the other an element is introduced wholly independent of the apparatus.

Under the first head I may mention the long splint, the upper end of which was attached to the trunk by means of straps, bandages and perineal bands to provide for counter-extension, while extension was obtained by drawing down the parts connected with the lower fragments and securing them to the lower end of the splint. This simple device was elaborated by the attachments to the upper part—a bent iron shoulder-piece (Hodge) and a foot-piece with adjustable slot and graduating screws, but the fact that the lower end of the apparatus must extend several inches beyond the ends of the patient's feet, made the apparatus impracticable under ordinary circumstances and has driven a most admirable contrivance entirely out of existence.

The principle aimed at in the use of the long splint was afterwards attained by the employment of plaster of Paris. This was applied to the trunk and pelvis with a view to provide for counterextension, and then during extension was continued down the thigh covering in the entire extremity. This had the advantage of compactness and simplicity, but experience soon developed the fact that the counterextension was irksome and called for so many points of relief that the final results revealed a degree of disappointment that dampened the ardor of its early advocates and has left this as a mode of treatment to only a few who still feel that it offers the best means at our disposal for dealing with this formidable accident.

To overcome the tendency to angular deformity the

double inclined plane was devised Upon this instrument was lavished all the skill of the mechanician—carved splints, extension pieces, adjustable joints with ratchets to establish fixation at any point, foot-pieces with extension plates and screws But the final verdict was that no better results were attained than by simpler devices, and this theoretically perfect instrument sank slowly but surely to unmerited obscurity It is still described in text-books, and very properly so, not with a view to recommending its use but rather to show what has been attempted in that line and why it has failed

Of the second variety is the method of Buck in which gravity is used as the extending agent through pulley and weight attached by means of adhesive plaster to the parts below the seat of fracture It is the simplest method, has enjoyed the greatest popularity and is still employed in many of our largest hospitals So far as results are concerned there is really but little choice between methods Within a couple of weeks from the reception of the accident the pain at the seat of the injury measurably abates and from this time on the restlessness of the patient may defeat the efforts of the most skilful surgeon with the most perfectly devised apparatus One of the most common and glaring abuses of Buck's extension is the sliding down in the bed until the patient's foot rests against the foot-board of the bed To prevent this the foot of the bed is raised, but rarely with any good result and the final result, with the best apparatus and the most skilful surgeon, shows that the best directed efforts may be thwarted by unruly and ungovernable patients

In my treatment of fractures of the thigh-bone I have for many years been in the habit in selected cases of making the sound limb act as a splint and a means of counterextension to the injured one I first began the practice in young children Having first carefully enveloped the entire sound limb in protection it was enveloped in plaster of Paris A similar course was pursued with the injured limb except that the plaster of Paris did not extend above the knee The plaster was now permitted to set and get perfectly hard after which

extension was made and when the two limbs were in symmetrical position a plaster bandage was made to bind both feet and legs together. With such a simple dressing I have had no further trouble throughout the entire treatment and in some instances have attained results with no ascertainable defect.

FIG 1

FIG 2

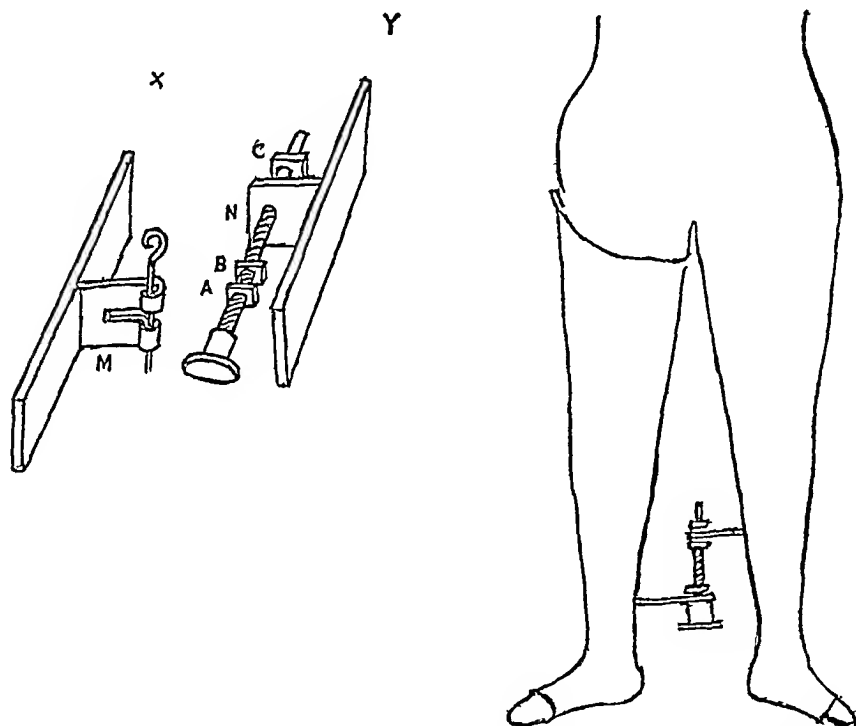


Fig 1—The parallel plates X Y made of iron  $\frac{1}{4}$  in thick, 3 in wide, 6 in long. The attached pieces M N are about 3 inches long, M has a slot in it, N has a thread for the bolt. The nuts A B C are for fixation after the requisite amount of extension and rotation has been made.

Fig 2—The apparatus has been incorporated by means of a plaster bandage with the cast. The inequalities of the limbs have been overcome and the nuts tightened.

The reason for putting each limb in plaster separately and letting the plaster harden before binding them together is that after the first has fully hardened there is no danger of applying the final bandage so tightly as to make pressure sores possible.

In applying such a dressing to an adult I have found the resistance to extension even under ether, quite as much

as a strong man could overcome and in one instance the plaster cast shifted its position and produced a pressure sore

To obviate the necessity of administering an anæsthetic or depending upon an assistant to make traction, I have employed an apparatus illustrated in Figs 1 and 2. The traction is so gradual, so firm and irresistible, that the patient hardly experiences any pain, while the satisfaction of comparison as the extension is being made is very great. Should there be any change in the relation of the casts and a slight shortening take place, a few turns of the connecting bolt will at any time rectify it. This apparatus is not confining, it will not prevent the patient from working down in bed until his feet rest against the foot-board, but both feet and both extremities must move in parallel lines and this change of posture will not affect the symmetry of the limbs. With this apparatus I have obtained union without appreciable shortening in a fracture of the neck of the femur partly within and partly without the capsule that immediately after the accident presented a shortening of an inch and a half. As a simple inexpensive and effective appliance for treating fractures of the femur I cannot too strongly urge it upon those whose patients are at a distance and cannot be seen daily.

One point in the dressing that I have regarded with special favor, is that while extension and rotation are provided for in the bolt and nuts, the apparatus does not conceal the injured limb. Hence any angulation laterally or any tendency to forward projection of the upper fragment can be readily detected as the swelling subsides, and minimized if not entirely corrected by appropriate measures.

This means of traction and fixation will be found most advantageous as a preliminary step to nailing or screwing the fragments together in delayed and imperfect union in intra-capsular fracture of the neck of the femur.

# MODERN MEDICINE AND SURGERY IN THE ORIENT<sup>\*</sup>

BY J EWING MEARS, M D,  
OF PHILADELPHIA, PA

IN Japan education in medicine is a part of the general system, which is as complete in its development as may be found in any country of the world. The educational centre is Tokyo, where one of the great universities of Japan is located, the other being Kyoto. Of the one hundred and thirty-one professors in the University of Tokyo, the College of Medicine has twenty-four with four or five hundred students. There are two hospitals connected with the college, having a total capacity of five hundred and seventy-one beds.

In addition to the College of Medicine of the University there are in Japan eight other medical colleges. Foreign physicians, who are graduates of medical colleges having a reputable standing, will on application be granted a license to practise. There are a number of hospitals in addition to those connected with the medical colleges.

There is a training school for nurses connected with the Red Cross Hospital. They receive a very practical instruction by lectures and demonstrations, and are made nurses and not half doctors. They serve an apprenticeship of three years. A graduate nurse in private practice receives from fifty to seventy-five cents a day.

In no other part of the world is the Red Cross Society so perfectly organized or so efficiently equipped. The Society owns two hospital ships. It is the largest in membership as well as the richest Red Cross organization in the world.

Japan also has a well equipped school for the instruction of its medical military officers. Massage is practised generally among Japanese people.

Japan undoubtedly takes the first place in the Orient in all that relates to the adoption and cultivation of modern scientific medicine.

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\* Abstract of a paper read by title at the meeting of the American Surgical Association, May 5, 1908

In China, outside of the few hospitals and fewer medical colleges connected with them under British or American control, modern medical science does not have a very firm foothold

The Canton Hospital, which was opened in 1835 by Dr Kerr, a missionary, has had a place in the records of surgery for many years by reason of the large number of cases of vesical calculi operated for by Dr Kerr. In Canton, as is well known, the sanitary regulations are not enforced, but, in marked contrast to the conditions in Canton, one sees much in Shanghai which gives evidence of the influence of Western civilization, especially outside of the Chinese part of the city. There are four hospitals. In considering the state of modern medicine in China, it is necessary to bear in mind that it has reached its highest development in those cities in which there is a large foreign population.

In India, Bombay is the seat of the Grant Memorial College, the largest of the four medical colleges of the country. Connected with the colleges are hospitals used in conducting clinical and laboratory instruction. The teachers in the colleges and the staffs of the hospitals are taken from the medical officers of the Indian Military Service. The medical colleges are in affiliation with the universities which constitute the head of the educational system carried on by the British Government. Very few Mohammedans enter the medical profession. The Government, with all its power, refrains, except in extreme conditions, from the enactment and the execution of various desirable laws and sanitary regulations calculated to disturb the uneasy sensibilities of the natives.

As to the plague in India, inoculation is gaining favor, and it is believed that before very long opposition to its practice by the native population will be generally overcome. In Bombay Dr Mears was informed that but two varieties of plague rats had been identified—*Mus Rattus* and *Mus Decumanus*. Since his return, in studying the reports from San Francisco of the Marine Hospital Service, he notices the statement that in addition to these there have been identified the *Mus Alexandrus* and *Mus Musculus*. Dr Mears found the homes for lepers in various cities in India of much interest.



# TRANSACTIONS

OF THE

## AMERICAN SURGICAL ASSOCIATION.

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*Annual Meeting held at Richmond, Va., May 4, 5 and 6, 1908*

The President, WILLIAM H CARMALT, in the Chair

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### I ADDRESS OF THE PRESIDENT

DR WILLIAM H CARMALT, of New Haven, Conn, the president, referred to the advance in medical science, particularly in pathological anatomy, during the last half century brought about especially by the greater facilities of surgical technic. The discoveries of anæsthesia and asepsis paved the way to early operations and thereby at once opened a new field, giving the opportunity to early observations of pathological processes. Instead of operations as a last resort to obviate impending death, they are now largely undertaken for distinctly therapeutic purposes. The local character of the initial stage of tuberculosis was cited and its transference from internal medicine to surgery remarked upon. Tuberculous peritonitis was cited as a striking instance. The knowledge gained of the internal secretions, as shown in operations on the thyroid gland, was obtained almost exclusively by surgeons. The very recent investigations on the parathyroids are instances of physiological and pathological advancement obtained altogether by surgical activity. The relations of pancreatitis to gall-bladder diseases and the pathology of chronic diverticulitis of the sigmoid are further instances of the debts of the pathological anatomist to the surgeon. The establishment of fully equipped pathological laboratories in hospitals was strongly urged and the advantages to the hospital of clinical teaching in its wards insisted upon.

### II THE EARLY DAYS OF THE AMERICAN SURGICAL ASSOCIATION

DR J EWING MEARS, of Philadelphia, delivered this address, for which see page 833

## III SURGERY OF THE GASSERIAN GANGLION

DR STEPHEN H. WEEKS, of Portland, Me, read a paper in which he gave an opinion that the removal of the Gasserian ganglion as a primary operation for the relief of tic douloureux is not justifiable, but that the extracranial operations upon the branches of the fifth cranial nerve should be first made. The osteoplastic flap in the temporal region called the Hartley-Krause operation is the one Dr Weeks employs. A pint of normal salt solution with an ounce of brandy should be injected into the rectum about half an hour before the operation commences. In all his operations on the brain he has used ether. In the operation the second and third divisions are put upon the stretch with the blunt hook and divided close to the foramen rotundum and foramen ovale respectively. He dissects them back to the ganglion and lifts the ganglion from its bed by making traction on the inferior maxillary nerve, having first divided the superior maxillary nerve and removed the parts of the ganglion corresponding to these various divisions, leaving untouched the first division, with its corresponding portion of the ganglion. If the first division of the nerve and its corresponding portion of the ganglion be retained there will be no danger to the eye, and the only protection needed to the eye will be a simple compress and bandage. Sometimes the dura mater is considerably torn and the cerebrospinal fluid escapes during the manipulation of the brain. Dr. Weeks has seen no bad results follow this. On the contrary, it has seemed to be an advantage, as it allows the lifting of the temporosphenoidal lobe more freely from the middle fossa, giving a better view of the ganglion and its nerves. In his last case when the dura was dissected from the ganglion, though quite a little brain matter escaped, no unpleasant symptoms followed. The mortality of the operation thus far in his hands has been nil. He has operated four times.

## IV TREATMENT OF ACUTE GENERAL PERFORATIVE PERITONITIS

DR JOHN B. MURPHY, of Chicago, presented a paper upon this subject, for abstract of which see page 870.

DR JOHN B. DEEVER, of Philadelphia, emphasized the necessity of attacking the condition early and of doing as little as possible in the matter of manipulation. He has no hesitancy in

reopening the abdomen for obstruction In ten consecutive cases all recovered Short anæsthesia he regards as important He uses eserin reinforced with strychnia In some cases there has been slight cardiac disturbance from the eserin He has no hesitation in setting his patients up in bed Concerning the giving of morphia, he "does not know what a hypodermic syringe looks like for the purpose of giving morphia"

DR ARPAD G GERSTER, of New York, within the last two years in his hospital service has abandoned methods of irrigation and mopping formerly employed and has followed the plan laid down by Dr Murphy, with the Fowler position, and the results have been markedly improved He has used eserin in the treatment of tympanitis following diffuse peritonitis, but is not so enthusiastic concerning the results as some are Contributory to the improved results in the treatment of general peritonitis are the facts of improved technic, early recognition of cases and the inclusion in the group of general peritonitis of cases easily cured by proper treatment He described a simple modification of the enemata by which the irrigating rectal injection is carried high into the rectum and after being allowed to escape, repeated Peristalsis is thus provoked and large quantities of gas made to escape He finds this method more effective than the use of eserin, and being a mechanical procedure it may be safely left in the hands of the nurse He thinks Dr Deaver's stand in regard to the giving of morphia an extreme one While the excessive administration of morphia is wrong, the entire withholding of it he regards as unnecessary and cruel

DR ARTHUR D BEVAN, of Chicago, in some cases of fluid in the peritoneal cavity employs a female glass catheter, using it as a pipette, taking up the pus not only in the cul-de-sac but in other directions Many cases in which there is free pus, and cases of duodenal ulcer operated upon early in which there is a considerable amount of fluid, are regarded by him as cases in which general peritonitis has been prevented by early interference, and not cases of general peritonitis This obviously has a determining influence upon statistics He has found nitrous oxide gas of much value as an anæsthetic Frequently the giving of either ether or chloroform in these cases turns the scale between recovery and death He disagrees with Dr Murphy regarding the danger of washing out the peritoneal cavity, believing that irrigation is good surgery and that it can be done without loss

of time In the matter of drainage he favors the large cigarette drains in preference to rubber tubing

DR DUDLEY P ALLEN, of Cleveland, agrees with Dr Bevan that the washing out of septic material from the peritoneal cavity is a valuable aid in treatment He places the patient on the side when draining to have the aid of gravity and limits the washing to the area involved

DR JOSEPH RANSOHOFF, of Cincinnati, feared that if the dictum went out to the general profession that free general peritonitis recovers in the proportion of 44 to 3, the average practitioner would delay in seeking surgical aid with the thought in mind that if the patient did get worse he had 44 out of 47 chances of getting well He asked Dr Murphy in closing to state in how many of the 47 cases the operation was done after four or five days subsequent to the development of symptoms of general peritonitis and in how many cases he operated in which death seemed imminent

He called attention to the general use of the word peritonitis, suggesting that but few understand by the term exactly the same thing Free fluid in the peritoneum is not necessarily infected and its presence should not be regarded as evidence of peritonitis until cultures show infection

DR ALGERNON T BRISTOW, of Brooklyn, showed a device with which he regulates the passage of the fluid to about 90 drops per minute in rectal irrigation

DR GFORGE E ARMSTRONG, of Montreal, has followed the teaching of Dr Murphy in the treatment of peritonitis with very great improvement in results He attaches great importance to induced drainage by rectal injection in the sitting position In two cases recently under his care with persistent vomiting and with swelling in the epigastric region, he thinking the condition due to retromesenteric pressure on the transverse duodenum, reversed the position of the patients from the Fowler to the Trendelenburg with satisfactory results

DR JOHN C OLIVER, of Cincinnati, inquired of Dr Murphy whether his method of treatment had been applied to gunshot wounds of the abdomen, especially to those cases in which injury had been inflicted several hours before operation He asked because, while there might be an honest difference of opinion concerning the forms of peritonitis following appendicitis or per-

forated gastric or duodenal ulcer, all agree that the form of peritonitis following gunshot wounds is apt to be general. Therefore, the results of treatment in that class would be of value.

DR JAMES E MOORE, of Minneapolis, said he had no word of criticism of Dr Murphy's paper, wishing only that he was able by any means to secure results so good. He protested against the dictum laid down by Dr Deaver that abdominal cases should be deprived of morphia. In the beginning of his abdominal surgery he had withheld morphia, but after having had an operation upon himself he insisted upon having morphia. He has since given it to his patients and his results are improved.

DR MAURICE H RICHARDSON, of Boston, said that peritonitis still remains the most important disease with which he has to deal, causing more deaths in his own cases, those of his colleagues, and in literature, than any other disease. He referred to the evolution in treatment from the time when a man's abdomen was made to look like a colander to the present, when a small incision and very little disturbance of the abdominal viscera are the rule. He could criticize only in the most favorable way Dr Murphy's method. In his hospital service he does not know that they use the method exactly, though they do not disturb things very much. They do not wash out. They do not wipe extensively. They do not make multiple incisions. They depend upon rectal lavage, and rather than have patients toss all night they give small doses of morphia.

DR JOHN B ROBERTS, of Philadelphia, said that Dr Murphy's paper disproved effectually the oft-repeated statements of those operators who for years have contended that all cases of perforative appendicitis and similar lesions should be treated by an *insistent* search for the offending organ. Also, it has shown effectively their error in believing that patients after abdominal section or with peritonitis from perforation should be tortured by persistent immobility in the dorsal recumbent position, by absolute deprivation of water, and by the ante- and postoperative withholding of morphia and pain obtunding drugs. Dr Murphy's results thus justified those who for twenty years have contended against such surgery.

DR RICHARD H HARTE, of Philadelphia, thought it obvious that no hard and fast rules could be laid down in the treatment of peritonitis, each case being treated rather according to the con-

ditions found. He thought error sometimes existed in the use of rectal irrigation in not having the tube of sufficient size and held at a proper height to favor the ready flow of the fluid toward the bowel. He described a frame made to support the weight of the patient by the buttocks and thighs as a satisfactory method of maintaining the Fowler position. He approves the plan of having patients sit up even in the typhoid perforation cases in which the perforation occurs at the end of a very long illness. He favors gauze for drainage rather than tubes.

DR M. L. HARRIS, of Chicago, has tried repeatedly the principles laid down by Dr. Murphy and his patients get well. Relative to the inquiry of Dr. Allen concerning gunshot wounds of the abdomen, he had had within a few months 17 cases of these wounds involving the intestines in which there were from one to eight perforations. Every case was operated upon early, all were drained and all recovered.

MR G. B. A. MOYNIHAN, of Leeds, England, said that at the Leeds' Infirmary they grouped their cases according to those occurring previous to their having learned of Dr. Murphy's treatment, and those occurring subsequently. Those of the former group they had been accustomed to lose. Those of the latter usually recovered. Only in very insignificant particulars do they vary from the method laid down by Dr. Murphy. They operate in the least possible time. In drainage employ a large sized rubber tube split along the wall of one side which when in position drains along its whole length and can collapse if pressure from tissue occurs. He takes issue with Dr. Deaver in the matter of morphia, a small hypodermic being given in every case before the patient leaves the operating table. No house physician, however, is allowed to repeat the dose without instruction from his superior officer. They usually do not employ general anæsthesia, but operate under lumbar anæsthesia by stovaine. An advantage of this method is the passing of abundant quantities of flatus. This makes the operation distinctly easier. The patients are placed in bed in an exaggerated Fowler position. The position is maintained by a bolster beneath the buttocks and thighs attached by straps to the head of the bed. No restraint is put upon the amount of water the patient desires to take, for the nurse leaves a vessel containing water on the table beside the bed.

DR MURPHY, in closing, emphasized his positive conviction

He has had one case of peptic ulcer subsequent to posterior gastro-enterostomy. He has collected and will publish a report of 60 cases of peptic jejunal ulcer following gastro-enterostomy.

DR W J MAYO, in closing, referred to the fact brought out that there could be secured not less than 80 per cent of permanent recoveries in gastric ulcers in which medical treatment had failed and that something less than 10 per cent more will be improved. The real difficulty in cases reported to be worse because of gastro-enterostomies he thinks lies in the fact that the medical diagnosis has not been confirmed at the operating table, and, because the operation has been done upon cases in which it should not have been done, the internist assumes the position that the cases are worse as the result of the operation. They have done the Rodman operation over twenty times. Rather than ask the medical man to turn over to him early cases of gastric ulcer, the surgeon should ask that he turn over cases of tumor the character of which he is waiting to determine. In these cases the surgeon can do better than the medical man if they are not malignant. If they are malignant it will put into the surgeon's hands a considerable number of malignant cases in time to cure them.

#### VI LIABILITY OF GASTRIC ULCERS TO BECOME CARCINOMA

DR WILLIAM L RODMAN, of Philadelphia, read a paper with this title, for abstract of which see page 922.

#### VII GASTRIC AND DUODENAL ULCERS SECONDARY TO WOUNDS OF THE URINARY BLADDER.

DR JOHN B ROBERTS, of Philadelphia, read a paper with this title for which see page 924.

DR JOHN E SUMMERS, Jr, of Omaha, inclined to the belief that trauma is the cause of postoperative gastric and intestinal hemorrhage.

DR WILLIAM L RODMAN, of Philadelphia, dissented from the belief of Dr Summers that postoperative hæmatemesis is due to trauma. His belief is based upon observations made upon dogs and inquiries of colleagues. He thinks the most rational explanation is that suggested by Dr Roberts that it is due to sepsis. He has used Pagenstecher's thread for the inner stitch in gastro-

enterostomy, but in one case there was furious hemorrhage. Copious vomiting occurred and in one large vomited clot there was the Pagenstecher suture. He questions therefore whether it is well to use a Pagenstecher suture or a well chromicized gut.

#### VIII CONGENITAL HYPERTROPHIC STENOSIS OF PYLORUS

DR FRANK E BUNTS, of Cleveland, read a paper with this title, for abstract of which see page 946

DR JOHN C OLIVER, of Cincinnati, said that he had seen within the past two years four cases of congenital stenosis operated upon by gastro-enterostomy. Two were his own cases, two those of his colleagues. In one of the cases (a female infant) the symptoms appeared at two weeks of age. There was a distinct family history of stomach trouble for three generations. The mother of this child during her pregnancy developed tuberculosis of the glands at the back of the neck. The mesenteric gland of the child showed an early stage of tuberculosis.

DR FRANCIS J SHEPHERD, of Montreal, did a pyloroplasty upon a child three weeks of age. The child is now 18 months old and in perfect health.

#### IX STONE IN THE KIDNEY, TUBERCULOSIS OF THE KIDNEY, PERINEPHRIC ABSCESS

DR GEORGE TULLY VAUGHAN, of Washington, D C, read a paper with this title, for abstract of which see page 1024

#### X THE DIAGNOSIS AND TREATMENT OF KIDNEY STONE

DR ARTHUR DEAN BEVAN, of Chicago, said that a diagnosis of stone in the kidney was to be arrived at by a process of exclusion, confirmed by the X-ray. When the diagnosis is definite the treatment should be surgical removal except in cases of small stones which may be passed, or in cases of extreme age, or in the presence of organic lesions which strongly contraindicate operation. In single stone in the pelvis of a comparatively sound kidney the operation of pyelotomy with closure is the operation of choice. In cases with large stones, and especially multiple stones in both pelvis and calyces, and in cases with considerable infection, nephrolithotomy with or without drainage should be resorted to. In cases in which stones are found in a kidney.



which is so altered as to be of little value to the patient, and where kidney sufficiency has been demonstrated, and the other kidney is not involved, primary nephrectomy should be done. In primary stones involving but one kidney, pyelotomy and nephrolithotomy are comparatively safe procedures, carrying with them but 3 to 4 per cent of risk. When both kidneys contain calculi the dangers of the pathological condition and the operation for its relief naturally increase. Where because of infection and destructive processes nephrectomy is required the dangers of the operation will depend upon the integrity of the other kidney and its functional capacity and the dangers resultant upon the surgical removal of the diseased organ. In Dr Bevan's own series of 52 operations done for kidney stone there was but one death from nephrolithotomy and two deaths from secondary nephrectomies. Both operations were extremely difficult because of the necessity of digging the kidney remnant out of dense scar tissue due to long-standing perinephric inflammation.

#### XI A LARGE KIDNEY STONE

DR DAVID BARROW, of Lexington, Kentucky, exhibited a large kidney stone weighing one pound and two drachms. For this paper see page 1028.

#### XII RESULTS OF OPERATION ON THE KIDNEY FOR CALCULUS AND TUBERCULOSIS

DR ANDREW J MCCOSH, of New York, presented this paper, the object of which was to trace first the future life-history of patients from whom in past years a tubercular kidney had been removed. See abstract on page 1022.

#### XIII THE DIAGNOSIS AND PROGNOSIS OF TUBERCULOSIS AND SEPTIC CONDITIONS OF THE KIDNEY

DR GEORGE E ARMSTRONG, of Montreal, read a paper with this title.

#### XIV ACUTE UNILATERAL HÆMATOGENOUS INFECTIONS OF THE KIDNEY

DR GEORGE EMERSON BREWER, of New York, read a paper in which he called attention to the early stage of this disease,

stating that the condition is not as a rule recognized by the profession. Nine cases were referred to, admitted to the Roosevelt Hospital during the past four years, of which only one came in with the correct diagnosis. A number of instances are given in which patients presented almost typical symptoms of appendicitis or cholecystitis, and under this mistaken diagnosis were subjected to operation exposing the gall-bladder or appendix. The writer divided the cases into three groups. In the first, or severest type of the disease, the symptoms are often ushered in by a chill. Mild surgical measures are of no avail. In the second, or intermediary group, the patients present symptoms often quite as severe as those of the first group, but the evidences of grave and progressive toxæmia are wanting. In these cases decapsulation of the kidney with the opening and drainage of visible areas of necrosis or suppuration, often leads to recovery, although a chronic nephritis may persist. Six cases of this type are reported treated in this manner with satisfactory recoveries. The third group comprises the mildest type of the disease. This requires no operation and is of surgical interest only because it accounts for certain cases observed by all surgeons in which, after a fairly characteristic history of a subacute attack of appendicitis or cholecystitis, operation reveals no lesion or sign of recent inflammation. The one pathognomonic sign present in all cases is a marked unilateral costovertebral tenderness.

#### DISCUSSION ON SURGICAL AFFECTIONS OF THE KIDNEY

DR LEONARD FREEMAN, of Denver, in operating for stone in the kidney prefers to cut through the parenchyma of the kidney. He finds that bleeding is easily controlled by grasping the vessels with gastro-enterostomy forceps with the flexible blades covered with rubber. He exhibited an X-ray picture showing shadows resembling calculi in the ureter which were spoken of by Dr Bevan as probably calcifications of the ligaments of the pelvis. Dr Freeman thinks they might also be classified as calcified lymphatic glands, or phleboliths. Another X-ray picture revealed a cured tuberculosis of the bladder.

DR GEORGE E BREWER, of New York, said that as a matter of fact, there are no symptoms absolutely pathognomonic of stone in the kidney. Of all the signs and helps he was of opinion that the X-ray is the most important. An absolutely good plate low-

ever, must be insisted upon. The small points shown over the ureter are one source of error. The majority of these shadows mistaken for stone he thinks are calcareous bodies. Another source of error was illustrated in a case of a man with history of renal trouble in which the X-ray showed a shadow perfectly distinct over the region of the kidney almost as large as an English walnut and with perfectly defined edges. This proved to be a kidney absolutely destroyed by tuberculosis.

DR NATHAN JACOBSON, of Syracuse, spoke of the value of the confirmatory test of the X-ray in cases of renal stone and showed a number of plates illustrating oxalate of lime, phosphatic and uric acid stones. He related a rare case in which treatment had been given by one of his confrères for cystitis. Dr Jacobson operated, and upon doing a perineal section a complete incrustation of the bladder wall was discovered. The child did well until anuria developed, and death followed. Autopsy showed both kidneys absolutely filled with stone.

DR C B G NANCY, of Ann Arbor, warned against making a diagnosis of stone in the ureter or kidney by the X-ray alone and described a case in which diagnosis based upon the X-ray was totally wrong. He asked Dr Bevan whether in the small percentage of failures to find the stone in the kidney or ureter by the X-ray the composition of the stone was determined. He had recently removed from the bladder quite a large stone which was entirely uric acid. He has never seen such a one in the kidney or ureter. Several X-ray plates showed not the slightest trace of the uric acid stone removed from the bladder.

DR ELLSWORTH ELIOT, Jr., of New York, confirmed the statements concerning the probability of osseous development in the ligaments of the pelvis which are mistaken for calculi. He emphasized what had been said of the atypical character of the clinical features in cases of stone.

DR JOSEPH RANSOHOFF, of Cincinnati, uses the X-ray only to confirm a diagnosis based upon a thorough clinical study. One symptom which he believes to be absolutely characteristic of stone in the kidney is persistent, continuous microscopic hæmaturia. An interesting point mentioned was that ureteral calculi sometimes produce no obstruction. Dr Ransohoff has before shown a ureteral stone which was guttered, the groove allowing the urine to pass without difficulty. He has no difficulty

in controlling hemorrhage in nephrectomy with the fingers and dislikes the clamp because it prevents examination of the ureter. Whether or not the X-ray shows stone, he never regards an operation on the kidney complete without the passage of a catheter or probe along the whole length of the ureter.

DR MAURICE H. RICHARDSON, of Boston, has had encouraging results in his operations for stone in the kidney, yet differing in experience from Dr. Ransohoff, hemorrhage causes him anxiety in the approach to the pelvis of the kidney through the kidney tissue. He has seen calcification of mesentery tumors twice or three times which he thinks could easily cause a mistaken diagnosis. He has known of the continuance of pain after removal of stone from the kidney, and has seen stone in the kidney fatal 22 years after removal of stone from the bladder, with no sign of pain during those years.

DR WILLY MEYER, of New York, believes that after exhausting laboratory research the X-ray should be employed in diagnosis of stone. Cystoscopy and catheterization should then be employed. The carmine test is of value unless obstruction is caused by the stone.

DR JOHN C. OLIVER, of Cincinnati, presented an oxalic acid stone which he had supposed was the largest one ever removed. That Dr. Barrow had removed a larger one was not surprising, however, for no matter what they did in Ohio, it was usual to find that they did a little better in Kentucky.

DR LEWIS L. McARTHUR, of Chicago, referred to a case in which clinical and laboratory evidence pointed to stone in the kidney but in which the X-ray failed to give the shadow. Operation was thus delayed for six months until the patient was insistent, and at operation twenty stones were found in one kidney.

#### XV STONE IN THE BLADDER, PNEUMATURIA, FECAL FISTULA

DR ALGERNON T. BRISTOW, of Brooklyn, New York, read a paper with this title, for which see page 1013.

#### XVI CARCINOMA OF THE FEMALE URETHRA

DR LEWIS S. McMURTRY, of Louisville, Ky., read a paper with this title for abstract of which see page 1032.

DR EMMET RIXFORD, of San Francisco, reported an operation for stone in the bladder, in which autopsy revealed four ureters, in three of which were stones. In another case operated for subacute peritonitis a small kidney was found in the vicinity of the vermiform appendix. The right kidney was hypertrophied. Regarding the cure of double tuberculosis following removal of one kidney he suggests an explanation in the production of hyperæmia by the blood being forced into the kidney somewhat after the Bier method in the cure of tuberculosis of the extremities. If this is true it would seem not impossible to secure healing of small foci in tuberculous kidneys by other means than nephrectomy. Tuberculin may have a future in that direction.

DR A G GERSTER, of New York, offered an explanation of the hemorrhage in nephrectomy occurring nine or ten days subsequent to operation, by the assumption of injury to a large arterial branch causing thrombosis, and that on the tenth day, the thrombosis becoming detached, the hemorrhage took place. In two cases he has been obliged to remove the kidney after simple exploratory incision in the pelvis because of uncontrollable hemorrhage. In one case it was shown that one of the large branches of the artery had been divided half way. He has since entirely abandoned the use of the knife in opening into the pelvis through the kidney and uses the following method. After incision of the cortical substance the knife is laid aside. With a curved director he pushes forward into the pelvis of the kidney. Along this he passes a dressing forceps into the pelvis. This instrument is opened and then withdrawn. The finger is inserted along the track which has thus been made by tearing and stretching.

DR FREDERICK KAMMERER, of New York, reported three cases of unilateral infection of the kidney. In the first case recovery followed the removal of one kidney. In the second case, showing but two infarcts in one kidney and the other being normal, the incised kidney was tamponed and replaced. Barring a severe hemorrhage the patient did well at first, but the ascent of temperature indicated the necessity of extirpation of the kidney. The third case was one of perinephritic abscess in which removal of the kidney was finally necessary. The urine after nephrectomy was normal, as was the temperature, seeming to prove the point made in Dr Brewer's paper that the infection can be unilateral.

DR JOHN H GIBBON, of Philadelphia, spoke of X-ray plates

as a most valuable means of diagnosing ureteral calculi. Also important is the presence of microscopic blood. He pointed out the danger of the use of metal ureteral bougies. He referred to his previously published account of two cases of ureteral stone in which he did a combined extra- and intraperitoneal operation. The two great advantages of the method were the time saved and the less possible traumatism. While the ureters should be drained after removal of stone there is little difference whether or not they are sutured.

DR. CHARLES L. GIBSON reported a case with features similar to those described by Dr. Brewer with pain in the left kidney. Minute miliary deposits were seen at each pole. Half of the kidney at each pole was removed and the woman perfectly recovered.

DR. GEORGE WOOLSEY, of New York, does not feel that a negative plate, even if considered perfect and taken by an expert is at all a sure sign of no ureteral stone. He has operated upon two cases in which he found the condition described by Dr. Brewer, and has obtained cure by nephrectomy.

#### XVII SARCOMA OF THE COMMON BILE DUCT

DR. FRANCIS J. SHEPHERD, of Montreal, read a paper with this title, for which see page 948.

#### XVIII RHINOPLASTY FOR SUNKEN NOSE

DR. JOHN F. BINNIE, of Kansas City, Mo., reported a case in which the nasal bones and soft parts of the nose are intact, the cartilaginous septum absent, the end of the nose and the alæ are retracted into the pyriform opening. Subcutaneously the soft parts, inserted then into the edge of the pyriform opening and pulled the mobilized nose into position. With a tenotome he subcutaneously tunneled the soft parts of the mobilized nose and drew strips of cartilage through these tunnels in such a manner as to act as trusses for the support of the nose. The strips of cartilage were secured from the costal margins.

DR. JOHN B. ROBERTS, of Philadelphia, referred to a similar case under his care of a young girl in which he had taken two large tongue-shaped flaps from her fat cheeks.

DR. LEONARD FREEMAN, of Denver, spoke of two classes of saddle nose, one in which the skin is loose and one in which there

is considerable cicatricial tissue and tendency to contraction Those of the former variety are satisfactorily treated by the use of paraffin, the latter by the employment of metal plates

DR EMMET RIXFORD, of San Francisco, spoke of the availability of the tissue of the rib in these operations for sunken nose

#### XIX FINAL PSYCHICAL RESULTS OF MAJOR SURGICAL OPERATION

DR JAMES G MUMFORD, of Boston, Mass , read a paper with this title, for which see page 853

#### XX IS HODGKIN'S DISEASE A TYPE OF SARCOMA?

DR WILLIAM B COLEY, of New York, read a paper based upon a study of upward of 80 cases of sarcoma primary in the lymphatic glands He stated that the small group of tumors designated as Hodgkin's disease or pseudoleukæmia, have certain definite clinical and histological characteristics sufficient to differentiate them from other tumors of the lymphatic glands, *e g*, tuberculosis and the ordinary types of sarcoma However, a close study, clinical, microscopical and anatomical, furnishes strong evidence that the process dealt with is a neoplastic one, so similar to sarcoma as to be properly classified as a variety or type of the latter The later history and autopsy record of a case published in detail in his former paper on Hodgkin's disease was given This case is much like the one reported by Gibbons, of San Francisco (Am Jour of the Med Sciences, Nov , 1906) Dr Coley furthermore stated that Hodgkin's disease closely resembles neoplasms, especially sarcoma, in the way in which it is affected by the X-ray and the mixed toxins of erysipelas and *Bacillus prodigiosus* He detailed a case of Hodgkin's disease, the clinical picture of which was quite characteristic, and in which the clinical diagnosis was confirmed by the microscope The disease disappeared under six weeks' treatment with the mixed toxins and the patient is perfectly well at seven months later There are no enlarged glands and spleen and liver are normal He expressed the following conclusions

The clinical features of Hodgkin's disease are often so nearly identical with those of round-cell sarcoma, that it is impossible to differentiate the two conditions

The histological features so closely resemble sarcoma that

if a given specimen be examined by different pathologists, opinions would be about equally divided between Hodgkin's disease and sarcoma

The onset of the disease, its course and duration, formation of general metastases, and final ending in death, most closely simulate sarcoma.

While in most cases the metastases occur in preëxisting lymph-gland tissue, this is by no means always true, since in some cases, *e g*, Dr Gibbons' and his own, the tumor breaks through the capsule, infiltrates the surrounding tissues, fascia, muscle, periosteum and the bone itself

The fact that Hodgkin's disease and leukæmia have certain features pointing to an infectious origin, should not exclude them from being classed as malignant tumors, but, on the contrary, this fact furnishes additional evidence in favor of the infectious origin of sarcoma

In view of the utter hopelessness of Hodgkin's disease as well as leukæmia, from surgical and medical treatment, and in view of the remarkable results obtained, though in a very limited number of cases, with the X-rays and the mixed toxins of crysipelas and *Bacillus prodigiosus*, the best chance of success apparently lies in a wider application of these methods of treatment, either singly or in combination

## XXI THE PSYCHIC FACTOR IN GRAVES' DISEASE

DR GEORGE W CRILE, of Cleveland, O, read a paper with the above title, for which see page 864

## XXII and XXIII CARCINOMA OF THE APPENDIX

DR RICHARD H HARTE, of Philadelphia, and DR ROBERT G LE CONTE, of Philadelphia, presented papers with this title, for which see pages 968, and 1000

## XXIV ŒDEMA OF LARGE INTESTINE WITH LOCALIZED NECROSIS OF ITS WALL, FOLLOWING SPLENECTOMY IN BANTI'S DISEASE

DR JOHN E SUMMERS, Jr, of Omaha, read a paper with this title, for which see page 1006



XXV WASHING OUT THE INTESTINE THROUGH MULTIPLE  
ENTEROTOMY OPENINGS

DR GEORGE H MONKS, of Boston, Mass , read a paper with this title, for which see page 953

XXVI CONGENITAL IDIOPATHIC DILATATION OF THE  
COLON (HIRSCHPRUNG'S DISEASE)

DR J M T FINNEY, of Baltimore, after reporting the case of a young boy upon whom he had operated, reviewed the literature of the subject to January 1, 1908 Two hundred and six references had been studied While to Hirschprung belongs the credit of having first called attention to the disease, a number of cases have been found in literature antedating his classical description After discussing the various terms that have been applied to the disease and its classification and the anatomy of that portion of the intestine concerned, Dr Finney discussed the various hypotheses as to its etiology Some ten theories have been suggested from time to time as to the causation of the disease including that of the author of hypernutrition These theories are all discussed and the arguments for and against given No one apparently explains every case but each will explain some The symptomatology was described and a complete clinical picture of the disease given, with a list of the series of cases observed in the Johns Hopkins Hospital, eleven in all The diagnosis, differential diagnosis, the different aids to the diagnosis, prognosis and treatment were considered While no one course of treatment seems applicable to all cases, the author suggests one method employed in his own case as perhaps applicable to a larger proportion than any other hitherto suggested, namely A preliminary enterostomy, then a colocolostomy some months subsequently, finally the complete excision of the affected portion The artificial anus is left open until after the success of the preceding steps has been assured, when it is closed under cocaine

DR LEONARD FREEMAN, of Denver, reported the case of a young man presenting a pronounced type of Hirschprung's disease He had been troubled with constipation ever since he could remember and as much as three months had elapsed at one time without a movement of the bowels The colon was enormously dilated below the splenic flexure The surface of the large intes-

tine was plicated and replicated and replicated again until it was reduced to something like normal size. It was impossible to make anastomosis or to resect the bowel. Enlargement of the mesentery was not noticed. The subsequent history of the case was reasonably good. Dr. Freeman would not ordinarily consider this operation of plication a good one for the ordinary case, but in the present case it answered the purpose.

## XXVII RECTAL DRAINAGE FOR PELVIC ABSCESS

DR ARCHIBALD MACLAREN, of St Paul, Minn., read a paper with the above title, for abstract of which see page 1034.

## XXVIII HÆMOLYTIC TESTS FOR CANCER

DR GEORGE W. CRILE, of Cleveland, Ohio, presented a report on the value of hæmolytic tests in the diagnosis of cancer. For purpose of control, 107 individuals in good health were subjected to hæmolytic tests, in none of which was any hæmolysis elicited. Fifty individuals, the subjects of miscellaneous diseases, were experimented upon, in four instances hæmolysis was elicited. These four included one case of hæmoglobinuria, one of eclampsia, one of hæmaturia and one gastric case,—diagnosis not made. Fifty cases of carcinoma were tested, of whom 39 presented hæmolysis, 16 cases of sarcoma, of whom 13 hæmolyzed, making a total of 66 cases of malignancy, of which 53 hæmolyzed.

Of cases of carcinoma recurrence, or cures, to prove if cured, ten tests were made, of whom nine gave no hæmolysis, one, questionable. Two cases of papilloma, one hæmolyzed, one, no hæmolysis. Eleven cases of surgical tuberculosis, nine gave hæmolysis. Ten cases of chronic suppuration, none hæmolyzed.

Of the 13 cases of malignant disease which did not give hæmolytic reaction, one was a gastric case, diagnosis not proven, one an advanced case of sarcoma of the spine, one an advanced case of presumed sarcoma, one advanced case of recurrent carcinoma, five were advanced cases of carcinoma of the breast, two were advanced cases of epithelioma of the neck, one an advanced case of lymphosarcoma; and one a case of cystic ovary.

In 14 cases of suspected malignancy that were subjected to

the test, in one hæmolysis was elicited. In all these latter, positive diagnosis of nonmalignant disease was arrived at, of these, two were gastric cases, four gall-bladder cases, two, tumors of the thigh, one, breast case (cyst), one, tumor of the chin, one, tumor of the clavicle, one, cystic ovary, two, cirrhosis of the liver.

As an example of the value of the method, specific mention was made of a case seen in the medical service of the hospital, March 18, 1908, which showed hæmolysis and reverse hæmolysis, in consequence of which a tentative diagnosis of carcinoma of the stomach was made, a diagnosis of anæmia having previously been made by the physician in charge. One month later, after palpation, a specimen of tissue from the stomach contents was obtained, from which an absolute diagnosis of carcinoma of the stomach was made.

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the liver and seemed to be located behind and above the colon. Urinalysis demonstrated the presence of a trace of albumen, an occasional hyaline cast, few erythrocytes and a number of leucocytes. The count of the white blood corpuscles numbered 12,300. There was no response to the tuberculin test. Temperature fluctuated between 98 and 100. Opinion as to diagnosis was divided between a malignant growth and pyonephrosis.

On June 10 I made a cystoscopic examination and observed a cylindrical plug of inspissated pus protruding into the bladder from the ureteral orifice of the right side, rendering the diagnosis of pyonephrosis indisputable. In Fig 1 are seen colored drawings depicting the cystoscopic findings.

On the same day Dr. George P. Muller exposed the kidney by Israel's incision and found it to be about 40 cm. in length and adherent to surrounding structures. These adhesions were so firm and dense that it was impossible to deliver the kidney and nephrotomy followed by the evacuation of much thick pus and drainage was performed.

**CASE II**—A C female aged 31 was admitted to the University Hospital November 6, 1907, complaining of pain in left side of abdomen. Aside from the facts that she had had diphtheria and one sister had undergone operation for tuberculous cervical lymphadenitis, the previous family and medical histories were negative. Two and one half weeks prior to her admission patient was awakened during the night by pain in the left side of the abdomen and lumbar region which was persistent and severe enough to double her up, on the fourth day radiating down groin to genitalia. This was accompanied by tenderness anteriorly and posteriorly and followed by vomiting continuing for a week of a greenish material. No urinary symptoms were present at any time. On admission the complaint was merely a dull ache and tenderness in the left lumbar region. The abdomen was soft and flabby and on the left side a palpable slightly tender mass movable with respiration extended to within one inch of the median line. The urinalysis was essentially negative, the absence of leucocytes being especially noteworthy. Blood count showed the white blood cells to number only 11,200 and the temperature was never over 98.3-5.

Three days after admission I made a cystoscopic examination with the expectation of catheterizing the ureters to determine the



diagnosis based upon bilateral catheterization of the ureters to estimate the comparative function or sufficiency of one or both kidneys. It may be claimed that such men as Casper Kummell, Rumpel and Zuckerhlandl are enthusiasts in this line of work and over exaggerate the value to be derived from these difficult and technical procedures. However the results obtained and to be observed in their clinics dispels any thought of doubt. Time forbids a detailed discussion of the technique and indications for the various methods entering into the determination of the functional capability of the kidneys. Suffice it to say that these in addition to the usual physical chemical and microscopical examinations are *cryoscopy*, the *phloridzin test*, *urea determination*, the *indigo carmin test*, *methylene blue test* and the *electrical conductivity of the urine* of which the last three are least important and generally superfluous. Many are prone to consider on first thought functional kidney diagnosis and cryoscopy as synonymous. Nothing however could be more erroneous. Cryoscopy or the determination of the molecular concentration of the blood and urine is merely one of the several methods of ascertaining the functional sufficiency of the kidneys. Dependence upon the results of cryoscopy alone has led naturally in many cases to grievous errors in diagnosis.

The following is the preparation and routine method of examination employed in the treatment of a given case for the determination of the renal function.

Previous to the examination the patient is given a definite diet namely a breakfast consisting of 5 oz. of milk, a roll and two soft eggs. Thus restricted ingestion of fluids is given because of the occasional occurrence of nervous polyuria and diuretic influence of phloridzin. A thorough cystoscopic examination precedes and not infrequently renders a catheterization of the ureters unnecessary, sufficient evidence being demonstrable in the bladder to explain the symptomatology.

After thoroughly irrigating the bladder always under the most aseptic precautions both ureters are catheterized employing the double barreled ureteral cystoscope. The first few drops of



urine should not be saved, owing to the fact that the end of the catheter may have taken up pus cells or other matter from the content of the bladder during its passage through the same, or because of trauma and diapedesis at the time of manipulation, a few red cells may have found their way through the eye of the catheter. After one to three c c of urine have been collected in tubes, carefully designated *right* and *left* to avoid confusion, these are replaced by two others. If the urine is now dropping from both catheters, desirably *one centigramme* of phloridzin is injected intramuscularly. At the end of 15 to 20 minutes two more tubes are substituted and a few additional c c of urine collected. We now have six tubes containing urine. The first pair serve for the microscopic examination, the second pair for the determination of the freezing point and urea, the third pair for the estimation of the artificially produced sugar.

Cryoscopy of the blood, on which formerly so much stress was laid, is falling into disrepute as a valuable diagnostical aid, although Kummell and Rumpel still attach no little importance to this procedure in urinary surgery. But even they no longer assert a lowering of the freezing point of the blood to  $-0.60^{\circ}$  to be the limit for nephrectomy. Albarran,<sup>20</sup> Casper,<sup>21</sup> Israel,<sup>25</sup> Senator<sup>23</sup> and Koranyi<sup>24</sup> are all unanimous in the following conclusions:

- 1 The lowering of the  $\Delta$  of the blood to  $-0.60^{\circ}$  and beyond may be independent of any renal lesion. Kummell and Rumpel themselves recognize the possibility of this happening in various circumstances, in lost cardiac compensation, anæmia, diabetes, eclampsia, epileptic attacks and in large intra-abdominal tumors. In all these cases accumulation of carbonic acid in the blood from respiratory insufficiency may determine the lowering of the  $\Delta$  of the blood.

- 2 The normal  $\Delta$  of the blood  $-0.56^{\circ}$  does not indicate that the renal function is insufficient.

- 3 When the kidney is diseased the  $\Delta$  of the blood may be  $-0.60^{\circ}$ . Great molecular concentration of the blood has been observed in cases of unilateral hydro- and pyonephrosis, cancer of the kidney and even in renal colic.

4 When the two kidneys are diseased the  $\Delta$  of the blood may be normal. A single kidney is sufficient to maintain the normal degree of concentration of the blood and this work may perhaps be performed by the parts of the parenchyma of each kidney that are still intact. Each of those kidneys considered alone would be insufficient.

Albarran <sup>6</sup> and others believe that the study of the molecular concentration of the blood is only of practical interest in exceptional cases. When the  $\Delta$  of the blood is below —0.58 or —0.60 it may raise a suspicion of a bilateral lesion but in the greater number of cases we can arrive at a precise diagnosis by other methods and notably by analysis of the separate simultaneously collected urines of the two kidneys. When from any reason it is impossible to study separately the urines of the two kidneys the investigation of the blood has a real interest. Upon the two repeatedly demonstrated hypotheses that *normally both kidneys at a given time excrete identical urines and that sugar is normally equally excreted by both kidneys after phloridulin injection* are founded the beliefs of the advocates of modern kidney diagnosis. This naturally necessitates the synchronous bilateral catheterization of the ureters for the collection of urine over a given period of time. According to Casper <sup>1</sup> this is the all important point and it is only by a comparative study of the simultaneously catheterized specimens of urine that an indisputable judgment can be formed as to the sufficiency or insufficiency of the corresponding kidneys. On the other hand there are some including Israel <sup>5</sup> Kapsammer <sup>7</sup> and Albarran <sup>6</sup> who deny that the composition of the urines of the two healthy kidneys at a given time is identical. Their objection however is vastly outweighed by the positive assertions of Casper <sup>1</sup> Richter <sup>8</sup> Zuckerkandl Friedrich Strauss <sup>23</sup> Fedorow <sup>29</sup> Bardier <sup>30</sup> Frenkel <sup>31</sup> and others. Many errors have arisen because of the attachment of too much importance to very small differences. Again there has been a tendency just as is so often the case in other conditions medical and surgical to seek for some sign or test disregarding all the associated diagnostical

aids and procedures, and to make functional renal diagnosis bear the entire brunt of the burden, whereas it is, and only should be, a link in the chain of diagnostic evidence

In order to illustrate forcibly the great value of modern renal diagnostical methods relative to the estimation of renal sufficiency, allow me to record the following cases

CASE III—M H, female, aged 39, was admitted to Dr Frazier's service at the University Hospital on October 16, 1906, complaining of dysuria with frequency and urgency of urination and some tenderness in hypogastric and appendiceal regions. Although she has never been of robust development, the family and previous medical histories were negative save that one sister died of tuberculosis, and that for the past eight years there has been occasional frequency of urination and an attack of "malarial fever" of three weeks duration during the previous summer. On admission patient had the above subjective complaints, at times associated with a heavy pulling sensation and some tenderness in the right flank, just beneath the costal margin. Recently, leucorrhœa following urination and loss of weight have occurred. In the right flank, extending about two inches below the costal arch, is a firm, smooth, readily palpable mass, very slightly movable and only moderately tender on manipulation. Temperature did not fluctuate and never rose over  $98^{\circ}$ . Leucocytic count numbered 4,560. Urinalysis of catheterized specimen demonstrated presence of albumen and a large quantity of pus containing the bacillus tuberculosis.

Two days after admission I catheterized the left ureter using the Kelly instrument to determine the functional condition of the left kidney. During this procedure large quantities of pus were observed to flow from the right ureteral orifice. The urine collected from the right side upon analysis proved to be normal and was productive of no lesions upon inoculations into guinea pigs, conducive therefore to a favorable prognosis following nephrectomy.

Shortly afterward Dr Frazier performed nephrectomy and ureterectomy of the affected side, and a kidney the seat of advanced tuberculosis both macroscopically and microscopically was removed.

CASE IV—Male, 34 years, family history negative, in early

life frequently had cervical lymphadenitis syphilis ten years previously nephritis two years ago No pains although almost continuous hematuria never colic or tenesmus Patient was very well nourished no fever liver palpable lungs showed no demonstrable lesions abdomen not tender In left hypochondrium an indistinct resistance not tender to palpation was recognizable Urine cloudy bloody albumen positive no sugar sediment demonstrated blood and pus no casts no tubercle bacilli Urination painless but every three to four hours more frequently by night

*Cystoscopy* showed a bullous œdema of mucous membrane about neck of bladder and in places the mucous membrane was studded with slightly elevated yellowish nodules Ureteral orifices presented no especial changes

*Functional Examination by Ureteral Catheterization —*

	Right	Left
Appearance	Clear	Cloudy
Amount	13 c.c.	12 c.c.
Sp g	1.026	1.010
Δ	1.64	0.43
U	0	0.00
Sac	2.4	0.2
Alb	0	Moderate
Sed	—	Pus and red cells

A glance at the comparative determinations of freezing points urea sugar albumen and characters of sediment reveals the unmistakable functional sufficiency of the right kidney Nephrectomy of left kidney demonstrated a *nephroblastosis* with *pyonephrosis*

**CASE V**—Male aged 60 in childhood had inflammation of the lungs About a year ago experienced pain in left side following spring over ditch Four days later had hematuria of short duration without pain Sometime later again hematuria this time with pain in left side Recently patient had lost weight (28 lbs) Never fever colic, or passage of stones Abdomen soft Right kidney palpable Under left costal arch distinct ballottement of a tumor extending from mammillary line to umbilicus movable with respiration smooth and tender on pressure Lateral position rendered the findings of palpation more distinct

Urine cloudy, sediment contained pus, no casts, but a few R B C, small amount of albumen, no sugar

*Cystoscopy* revealed a normal bladder, save a slight trabecular hypertrophy and minute blood coagula

*Functional Examination by Ureteral Catheterization* —

	Right	Left
Sp g	1 020	1 010
Δ	1 29	0 92
U	1 8	1 1
Sac	0 6	0 05
Sed	—	Pus, red cells
Alb	—	Moderate

Here again the importance in the estimation of the functional integrity of the right kidney is manifest Nephrectomy revealed a *hypernephroma* of the left side and the patient passed through an uninterrupted convalescence

Although urological surgery has not attained to the full development of its possibilities, and although few noteworthy advances may have been made during the past decade, as claimed by the opponents of functional renal diagnosis, nevertheless concensus of opinion indicates that important strides have been made and still greater ones are destined to occur along the line of functional kidney diagnosis

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# MULTIPLE AND CONSECUTIVE OPERATIONS UPON THE KIDNEYS FOR CALCULI.

BY W. WAYNE BABCOCK, M.D.,

OF PHILADELPHIA,

Professor of Surgery in the Medical Department of the Temple College,  
Surgeon in chief to the Samaritan Hospital

DESPITE the voluminous literature dealing with stone in the kidney, two problems at least have not been exhausted. The first concerns the tolerance of the renal substance of extensive or repeated operative traumatisms, the second, the frequency with which it is necessary to do consecutive operations upon the kidneys for nephrolithiasis. Watson's<sup>1</sup> recent article indicating that no successful bilateral nephrolithotomy has been reported indicates the lack of literature upon the subject. That the only successful case of bilateral nephrotomy for calculi is the one reported by Watson is scarcely to be credited. It seems more likely that other surgeons have, like myself, operated at the same time upon both kidneys for stone, but have delayed or neglected the report of their cases. Five years ago I did a double nephrotomy for bilateral calculus disease upon one of the patients whose history is appended. About a year later I again operated upon the same patient, doing a bilateral nephrolithotomy. In the following year one kidney was again drained and in 1905 a nephrectomy was done. Finally, in 1906, the remaining kidney was opened and a number of recurrent calculi were removed, this making the third consecutive nephrolithotomy upon the same kidney, and a total of seven operations upon the kidneys in a single case, from all of which the patient recovered. Another patient who recently had a nephrectomy had been subjected to five previous operations upon the kidneys for stone or the resultant suppuration,—a bilateral nephrotomy and nephrostomy having been performed at one time. These and five other cases herewith reported illustrate the feasibility of incising or exploring both

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<sup>1</sup> ANNALS OF SURGERY, Sept., 1907

kidneys at the same time of doing consecutive operations upon the same kidney or the not infrequent tendency for calculi to reform after removal

The tolerance of the kidney to operative procedure is greatly enhanced by the power of regeneration and hyperplasia possessed by the organ. In those cases in which a single kidney is found at birth the organ is usually twice and at times thrice the average size only infrequently is the size found to be normal. Likewise after the removal of a single kidney or its destruction by disease a compensatory enlargement of the other kidney is usual. Normally the amount of excreting tissue in the kidney is far in excess of the average need. Life may continue when but half or two-thirds of a single kidney functionates and it is evident that if life may continue with but a portion of a single kidney active that the hyperplasia which may gradually follow surgical resections should progressively tend to increase the eliminating capacity for urine provided destructive inflammatory processes do not occur. From this it would seem that the ability to do consecutive operations upon the kidney involving the removal or destruction of a part of the renal substance should be limited only by the ability of the organ to withstand the immediate trauma and its power to regenerate after the repeated surgical injuries. The most potent factor in preventing regeneration is infection. Pyelitis and pyelo-nephrosis lead to progressive destructive changes in the renal parenchyma inhibit tissue regeneration and hypertrophy and may render consecutive conservative measures inadequate or inadvisable and a recourse to nephrectomy needful.

*Recurrence of Renal Calculi*.—Under certain conditions the reformation of stones after nephrolithotomy is to be expected. These conditions include all the factors tending to the formation of stone which remain after the operation such as —

(1) *Infection*.—The most important factor in the primary formation of calculi is the presence of bacteria which produce chemical changes in the urine causing soluble substances in the urine to be precipitated in the form of insoluble compounds. If



therefore, infection of the renal pelvis persists or develops after the operation, or if there be an ulcerative pyelitis, or incrustation of the mucous lining of the pelvis or calices, then it is very likely that calcareous material will be deposited. At times the new stones escape through the ureter or through a drainage opening, the pyelitis under the better drainage gradually subsides and a cure results.

(2) *Failure to Remove All Stones or Fragments*—In the removal of large coral calculi it often happens that loose and brittle fragments from the surface of the calculus are left behind in the extraction. As these fragments may escape into dilated calyces or be washed to the dependent portions of the renal pelvis or into the ureter and in any case are prone to be obscured by a deposit of blood clot, it is a frequent occurrence that such particles are left behind. Likewise, in the removal of crumbly calculi which fracture or disintegrate during the extraction, it is often almost impossible to remove every particle of stone. Again where there are numerous calculi pocketed in the different dilated loculi of the calyces one may readily overlook many particles. In cases such as these the fragments of residual stones may wash down the ureter or they may remain and serve as nuclei of other calculi which later demand removal.

(3) *Other foreign bodies*, especially blood clots, bits of suture, filaments of gauze or cotton, unintentionally left in contact with the urinary stream serve as points for the precipitation of salts and the formation of stones. A drainage tube in the kidney or renal pelvis probably also favors calcareous precipitation just as such a foreign body is known to do in the urinary bladder. Nephrostomy and the permanent drainage of a kidney by a catheter theoretically favor the formation of calculi, and in Case II of our series a nephrostomy was followed by the recurrence of many stones within the kidney. Also in Case V calculi apparently reformed under drainage by a nephrostomy.

(4) Finally it cannot be assumed that the factors giving rise to the primary stone have always been eradicated by the

operation or even by careful post operative antilithic treatment. Therefore a recurrent calculus may form from the same influences as did the primary one. Fortunately the majority of patients operated upon for stone in the kidney require no secondary operation for retained or recurrent calculi although following the operation a persistent phosphaturia often associated with slight pyuria may continue for years without serious systemic effect. It is evident that surgical measures should be as thorough and complete as is feasible in the particular case that no foreign bodies should be left along the course of the urinary stream and when there is no infection drainage should either be dispensed with or used for as brief a period as is consistent with the needs of the particular case. In not a few cases an immediate suture of the renal parenchyma and of the over lying tissues without drainage may safely be carried out and will avoid the danger of secondary infection from the drain tract. While drainage through the loin is often demanded a permanent nephrostomy opening is undesirable. Two of our cases showed progressive renal infection and tendency for calculus formation despite continuous drainage through the loin. We can endorse Watson's conclusion that nephrostomy is indicated only in certain desperate conditions especially in malignant tumors of the bladder and in those patients whose surroundings and mode of life enable the proper care of the apparatus. Repeated nephrolithotomies are preferable in the treatment of recurrent nephrolithiasis to nephrostomy.

The reformation of calculi is to be expected in cases in which the kidney has contained many stones in those in which there is a well marked pyelitis a dilated or imperfectly draining renal pelvis or ureter large fragile calculi imbedded in the renal substance or renal or ureteral fistulæ.

*CASE I—Calculous anuria and recurrent renal calculi. Bilateral and consecutive operations including four nephrolithotomies one nephrotomy one nephrectomy one drainage operation. Recovery.*

Mrs H D M, married, aged 59 Multipara, of spare build, sallow complexion and well marked arterio-sclerosis. The patient for twenty years has suffered from indigestion, violent headaches and sacral backache. There was also dysuria and urinary tenesmus, which were believed to be due to a procidentia with a marked cystocele. Apart from an excess of urates the urine was apparently normal. In March, 1902, she came under my care when a plastic operation was performed upon the cervix and perineum together with a ventral fixation of the uterus. Following this operation the patient developed paroxysms of sharp pain radiating from the bladder toward the groin and left loin. About the fourth of September, 1902, the patient had a sensation of great hunger, she ate heartily and that night very severe, sharp, cutting pains developed in the left lumbar region which radiated toward the bladder. The patient vomited, the abdomen became tympanitic, there was a suppression of urine, and obstipation with retention of flatus. The temperature rose to 103 or 104 and the patient became delirious. Complete anuria persisted about twenty-four hours and by the fourth day the abdominal distention had partially subsided and it was possible to distinguish a large, oval mass of the size of a cocoanut in the left upper abdominal quadrant. In the right loin there was a renal shaped mass two or three times the size of a normal kidney which was not painful or tender. The fever and delirium persisting, on the sixth day of the attack a bilateral nephrotomy and a right nephrolithotomy were performed under ether. On the left side there was a large uronephrosis and a dilated ureteral orifice. No stone was found and while it was believed that there was a stone blocking the ureter the patient's condition forbade prolonged search. The right kidney contained a large fragile coral calculus filling the pelvis and the calyces below the equator of the kidney. The stone was disentangled from the renal substance with some difficulty and removed. Both wounds were drained, the patient progressively improved and during the convalescence passed two fragments of stone. The right sinus closed in about two weeks, the left after several months. In October and November, 1905, the patient complained of pain in the right loin, loss of appetite, insomnia and headache. The urine was slightly albuminous and contained tenacious shreds of muco-pus. A skiagraph by Dr Pfahler showed the presence of calculi in

both kidneys. The patient's abdominal walls were so thin *that the stones in the shrunken left kidney could be palpated between the two hands*. A bilateral nephrolithotomy was then performed four stones being removed from one and three stones from the other kidney. The sinuses soon closed but in 1904 paroxysms of nausea and abdominal tympany with pains in the left loin developed finally a small pyelonephrosis with secondary perinephritic abscess. A simple drainage operation was done under local anesthesia. The left ureter was evidently obliterated and a persistent urinary sinus remained which was so troublesome that on January 5, 1905 a left nephrectomy was done under the nitrous oxide-ether sequence. In the latter part of 1905 the patient was again troubled with attacks of colic involving the remaining kidney. It was considered inadvisable to administer ether or even make a skiagraph and on January 1, 1906 under spinal anesthesia by stovaine the third consecutive nephrolithotomy was performed upon the right kidney and five moderate sized stones were removed. After this operation twelve ounces of bloody urine were secreted during the first twenty-four hours about twenty-four ounces the second day and increasing quantities thereafter whereas after the previous nephrectomy the first day 46½ ounces were excreted the second day 34 ounces the third day 22 ounces and the fourth day 60 ounces. At the present time (December 1907) nearly two years after the last operation the patient is active and fairly vigorous the urine is excreted in excessive quantities varies in specific gravity from 1.010 to 1.015 and contains a moderate amount of albumin and varying amounts of mucus. There is no clinical evidence indicating further reformation of calculi.

**CASE II**—*Recurrent nephrolithiasis with secondary pyelonephrosis. Repeated nephrotomies or nephrolithotomies. Bilateral nephrostomy followed by progressive suppuration and recurrence of calculi in one kidney. Nephrectomy and abolition of renal drainage. Recovery.*

Miss N. K., age 22, of slight build and of poor development had suffered from nocturnal enuresis as a child and always had been troubled by urinary frequency. When sixteen an attack of influenza was followed by aching in both loins with pain radiating to the bladder. The right side was the more painful and was very sensitive to the touch. When eighteen years of age a right

nephrolithotomy was performed, the wound closed in three weeks and the patient remained well about one year. The left loin then became painful, and when twenty years of age the left kidney was opened and forty-six small stones were removed. The incision remained open for two months, was very painful and was complicated by the formation of small recurrent abscesses. Two months later the right side became painful, and when the patient was twenty-one both kidneys were opened by two operators working simultaneously and recurrent stones found in the right kidney. A bilateral nephrostomy was performed. After this operation the patient suffered from difficulty in securing adequate drainage and from recurrent pus collections in the left side. About six months later the left nephrostomy opening was enlarged under local anesthesia, pus evacuated and calculi removed. Later it became difficult to reinsert the tube after its removal for purposes of cleansing, and at times the nephrostomy openings required dilatation. Finally the left catheter could only be introduced when upon a specially curved stylet. The patient first came under my observation October 5, 1907. Catheters had then been worn continuously in both kidneys since May, 1906. The urine from the right kidney is moderately turbid, but from the left kidney is very purulent and offensively ammoniacal. On expression quantities of foul pus exude from the left loin especially after the removal of the drainage catheter. The injection of colored fluids into the renal pelvis proves a free communication from the right kidney to the bladder and complete obstruction below the pelvis of the left kidney. The skiagram shows multiple calculi in the region of the left kidney but none in the right. The patient was admitted to the Samaritan Hospital but despite diet, urinary antiseptics and renal irrigations together with the dilatation of the opening the left nephrostomy failed to drain properly and the suppuration and ammoniacal decomposition in the left kidney continued. On November 5, 1907, under spinal anesthesia by tropa-cocaine, a left nephrectomy together with the removal of the upper part of the ureter was performed. A large cylindrical calculus completely occluded the upper extremity of the left ureter and there were numbers of small stones in the renal pelvis and some of the dilated calyces were packed with concretions. The cortex was thin and the greater part of the kidney was occupied by a series of fetid pus distended

cavities not freely communicating with the renal pelvis. The right nephrostomy opening was dilated and then permitted to close spontaneously. Following the removal of the right nephrostomy tube the opening rapidly contracted and there was very little leakage through the back. Relieved of the suppuration the constant dread of the nephrostomy tubes slipping of the discomforts of renal irrigation and the continuous annoyance of an ammoniacal nephrostomy harness the patient ten days after the operation showed great mental as well as physical improvement. Later the residual kidney became painful fever developed and the nephrostomy drainage had to be renewed temporarily.

*CASE III — Right nephrolithiasis mistaken for appendicitis. Appendectomy. Nephrolithotomy and removal of over twenty calculi. Recurrent colic secondary nephrotomy. Recovery.*

Mr S K age 59 Manufacturer Plethoric. For many years has had paroxysms of pain in the region of McBurney's point. He alternates between diarrhoea and constipation sleeps well has a good appetite some indigestion and is morose and irritable. Seven years ago the pain and tenderness were so great that an appendectomy was done but the frequent attacks of colic in the right side continued and a secondary operation was considered for adhesions which it was believed had formed about the colon. I first saw the patient in 1903 when it was said he had been rejected for life insurance because of albuminuria. On examination no albumin was found in the urine but later the patient was seen at his house in a violent paroxysm of pain following which a few erythrocytes were found in the urine. There was a distinctly tender rather indefinite mass in the region of the right kidney and the jar of walking or of car riding produced pain in the right loin. There had been no typical ureteral colic. In May 1903 under ether anesthesia over twenty stones or calcareous fragments were removed from the right kidney. The c occupied in part the pelvis and a part of the dilated calyces the different cavities having such small communicating openings that four separate incisions through the cortex were necessary for their removal. Gauze drainage was used to the kidney the patient soon improved. Later there was a return of pain in the kidney which was relieved by a secondary nephrotomy about three months after the first operation. The mental depression

then disappeared and the patient continued well over four years from the time of the second operation

*CASE IV—Calculus in the right renal pelvis mistaken for appendicitis Appendectomy Removal of the calculus through an incision in the renal pelvis with suture, drainage Secondary pyelonephrosis and urinary fistula with recurrent calculi Nephrectomy Recovery*

Mr X Single, age 24 Physical condition and development good The patient had suffered from recurrent attacks of pain in the neighborhood of McBurney's point for which an appendectomy was done about two years ago The operation failed to relieve the patient of the attacks of colic which continued in the region of the appendix with some tenderness in the right loin The urine contained a small quantity of pus and blood The kidney was exposed and a calculus about one centimeter in diameter found in the renal pelvis The stone was removed by an incision through the pelvis of the kidney which was sutured and a small gauze drain introduced through the wound to the line of suture The patient left the hospital apparently improved but a urinary sinus formed in the region drained and later the patient developed signs of pyelonephrosis About four months after the second operation the patient first came under my care, and under scopolamin-morphin anesthesia the suppurating kidney was removed There had been no recurrence of calculi in the renal pelvis The patient made a good recovery This case well illustrates the danger of urinary fistula and renal infection after the removal of calculi through the pelvis of the kidney The danger is much increased if the gauze or drainage tube be left against the line of suture Had the stone been primarily removed by incision through the renal cortex the necessity for a secondary nephrectomy would have been less likely

*CASE V—Nephrolithiasis, uronephrosis, uroureter, nephrolithotomy, nephrostomy Imperfect drainage of distended ureter Development of pyelonephrosis Secondary nephrectomy and ureterectomy Death*

Mr W C, aged 25 American, clerk Fairly well developed but not robust, was admitted to the Samaritan Hospital September 21, 1905 For more than a year he had suffered from recurrent attacks of colicky pains in the lower left abdominal quadrant, which began and ended rather abruptly and were associated with

formation of a globular mass palpable about the left sacral brim. These attacks interfered with the patient's work and were gradually undermining his health. Diagnosis of intermittent uronephrosis and uroureter was made and under scopolamin morphin narcosis the left kidney was opened September 26, 1905. The pelvis was dilated and through the pelvis the finger could be passed into a greatly dilated ureter. An attempt to pass a sound from the kidney into the bladder failed the instrument being arrested just below the pelvic brim. A number of small calculi were removed and as the patient's condition on the operating table became critical the ureter was drained by a tube passed through the wound in the kidney and the patient returned to bed. The greatly enlarged ureter failed to drain properly so that despite irrigation and a tube passed through the nephrostomy opening there was a constant tendency for residual urine to remain in the ureter. The temperature was irregular varying from normal to  $102\frac{2}{3}$ , and as a rule the pulse ranged from 90 to 110. From time to time small calculi were washed from the kidney or ureter. As the patient became progressively weaker a second operation was attempted October 26th. The man was again anesthetized by scopolamin morphin the kidney was exposed and adjacent to the wound tract many miliary abscesses were found. A second incision was made above and nearly parallel to Poupart's ligament on the left side the peritoneum pushed forward until the thick wall of the ureter which had a diameter of 3 or 4 cm. could be exposed isolated and divided low down. The kidney and upper end of the ureter were then freed through the incision in the loin and the kidney with the attached ureter removed. The wound was packed with gauze and the patient very weak was hurried to bed. Several hours later there was some ooing from the wound and the packing was renewed. The patient grew rapidly weaker the temperature rose to  $105.4^{\circ}$  F and death occurred about nine hours after the operation. For this patient perhaps a better primary operation would have been a nephrectomy or a ureterostomy the ureter being brought out through the loin. With uretero-vesical anastomosis in such a case there is a question if the dilated ureter would not serve as a pocket for residual urine and be a cause of later trouble.

CASE VI—*Nephrolithiasis ureterolithiasis vesicolithiasis Litholapaxy and secondary nephrolithotomy* Recorder



Mr I H, aged 30, tailor Previous family history negative Well nourished and developed Enjoyed good health until three years ago when colicky pain developed in the right loin and was followed by the passage of a small amount of blood in the urine The patient was free from pain for two years when there was a second attack of colic, since the second attack there have been repeated attacks involving the left loin but the right side is free from pain Recently there has been a sudden cessation of the stream during urination followed by the passage of a few drops of blood stained urine There is much irritability of the bladder with frequent urination Skiagrams show a small shadow in the region of the pelvis of the left kidney, small shadows in the region of the lower end of the left ureter and also larger shadows in the area of the bladder The patient was admitted to the Samaritan Hospital May 28, 1907, and two days later the vesical calculi were crushed and evacuated under spinal anesthesia The operation demonstrated the importance of cystoscopy after litholapaxy to prove that all fragments have been removed A few days after this a small stone was removed from the left renal pelvis

As the stones in the lower end of the right ureter were producing no symptoms, and as they were so small that there was a possibility of their passing into the bladder, no attempt was made at their removal The patient made an uninterrupted recovery and was discharged from the hospital seventeen days after the nephrolithotomy Six months later the patient continued free from colic

CASE VII—*Left ureteral colic due to right nephrolithiasis Operation, exploration of both kidneys, left nephrolithotomy Return of colic, passage of large calculi, final recovery*

Mrs J C, aged 38 Had suffered from recurrent attacks of numbness and colicky pain in the left loin for seven years For the past two years the paroxysms have been much more severe About January, 1906, the patient, after an attack of colic, passed a number of fair sized phosphatic stones The X-ray showed about five calculi in the region of the right kidney but none in the region of the left The patient has never had pain upon the right side The urine was alkaline, had a specific gravity of 1.018, contained a trace of albumin, no sugar, and the microscope showed a moderate number of leucocytes, phosphatic crystals and some mucus The patient was admitted to the Samaritan

Hospital March 14 1906 and the same day both kidneys were explored under scopolamin morphin narcosis The left kidney was negative and the kidney was at once replaced and the wound closed The right kidney was incised and a number of calculi removed from the dilated pelvis The right side was drained and the sinus remained open with intermissions until the following fall During the summer the attacks of renal colic returned and in November 1906 the patient again passed a number of phosphatic calculi after a severe paroxysm of ureteral colic Since this time there has been no definite attack of colic and although the urine still contains mucus a small quantity of albumin and a moderate number of pus cells there is no symptomatic evidence of the return of the calculi

### CONCLUSIONS

(1) In the absence of infection bilateral or consecutive operations upon the kidneys are well borne

(2) Nephrolithotomy is frequently followed by the reformation of stone in the kidney

(3) Nephrostomy may not only fail to cure arrest or prevent pyelonephrosis or relapsing nephrolithiasis but may even favor these conditions

(4) In operating for simple calculous disease of the kidneys spinal anesthesia by tropa-cocaine or stovaine is to be temporarily and with the most rigid aseptic precautions

(5) In bilateral and consecutive operations upon the kidneys spinal anesthesia by tropa-cocaine or stovaine is to be preferred

# TRANSACTIONS

OF THE

## NEW YORK SURGICAL SOCIETY.

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*Stated Meeting, January 8, 1908*

The President, DR JOSEPH A BLAKE, in the Chair

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### TECHNIQUE OF NEPHRECTOMY

DR SAMUEL ALEXANDER presented four patients who had been subjected to nephrectomy by him, for the purpose of illustrating a method of surgical approach to the kidney which he had practised in most of his cases requiring nephrectomy during the past two years

The incision was crescentic in shape, with the convexity of the crescent directed backward. The incision began at the lower border of the 12th rib at a point about two inches from the angle made by this rib with the erector spinæ muscles. The greatest convexity of the incision corresponded with the outer border of this muscle, and the lower arm of the crescent was carried downward and forward, and ended at a point about two inches below the crest of the ilium. In its deepest points the incision followed the outer border of the quadratus lumborum muscle and the outer border of the latissimus dorsi muscle. In subjects of unusual muscular development, the muscle fibres of the outer border of the latter muscle had to be divided. The skin and subcutaneous fat inclosed in this incision formed a flap which could be drawn outward, thus affording the maximum amount of space. The lumbar fascia was then divided, and the peri-renal fatty capsule exposed.

The advantages claimed for this incision were 1 That it gave ample room for the exploration of the kidney and for its delivery upon the loin 2 There was a minimum division of muscle structure, and therefore the occurrence of ventral hernia was prevented

In one case, the first in which this incision was used, the

crescentic incision was converted into the form of the Greek letter epsilon in order to secure more space than the first incision afforded. The crescentic incision had been used by Dr. Alexander in cases of rupture of the kidney renal calculus pyelonephrosis tuberculosis etc. with satisfaction and it could be recommended as doing away in most cases with the very extensive incisions which had come into fashion in recent years.

CASE I—Male 38 years old a salesman was admitted to Bellevue Hospital on May 25 1906 and was operated on for prostatic abscess and stricture a perineal prostatectomy being done. He was discharged on July 11 1906 and remained well for about ten weeks. He then began to drink heavily and complained of some pain in the loin which gradually disappeared. In May 1907 he had fever and developed a pain in the right side. He went to the Post Graduate Hospital where he was operated on for gall stones and the gall bladder was removed. He did not know if gall stones were found. He remained in the hospital about a month and left improved but still complaining of pain in the right side.

When the patient was re-admitted to Bellevue Hospital on October 1 1907 he made the statement that his urine had always been dirty and a week before admission he began to have difficulty in urination. He had pain in the region of the right kidney which radiated down the loin into the genitals. On Sept. 21 he stated that he had passed a small putty like mass which on drying became hard like lime.

Examination of the abdomen revealed tenderness on pressure in the right hypochondrium with rigidity of the right rectus possibly due to adhesions about the old scar along the costal margin anteriorly. A catheter was introduced and met with resistance in the prostatic urethra. This was dilated to 25 F. A cystoscopic examination showed marked redness and congestion about the right ureter which was greatly dilated and from which pus was flowing. Upon massaging the right kidney thick pus could be seen coming from its ureter. The left ureter was normal. The urine was light yellow acid with a specific gravity of 1.01 and contained a heavy sediment. The microscope showed many pus cells.

Operation. The kidney was very adherent on account of the former gall bladder operation. It was delivered with diffi-

culty, and the pedicle ligated *en masse*. The wound was drained and partly closed. The kidney was twice its normal size and contained four large abscess cavities, which drained into the pelvis, and many small abscesses.

The patient was discharged on December 5, 1907, in good general condition, with a small sinus posteriorly about 4 inches deep.

CASE II—This patient was a Greek cigar-maker who was admitted to Bellevue Hospital on November 6, 1906. He denied all venereal history and stated that he had always been well, with the exception of the fact that about twelve years ago he had passed a stone about the size of a coffee bean.

Twelve days prior to admission he had severe pain in the right side of the abdomen and in the lumbar region, with frequency of urination. The pain did not radiate down into the testis, and gradually subsided. Four days after this attack the patient noticed that his urine was red, this continued for two days.

At the time of his admission he had neither pain nor hemorrhage, but attempts to urinate sometimes caused pain in the region of the right kidney. The right kidney was movable and easily palpated. The left kidney was also movable and palpable, not tender.

Operation, Nov 17, 1906. The kidney was found to be greatly enlarged, and a small calculus was felt in the upper part of the ureter. While the renal artery was compressed, a blunt-pointed bistoury was thrust into the posterior surface of the kidney. When this was removed, a large amount of cheesy material was squeezed out. The kidney was then split longitudinally, and many miliary abscesses were found in its substance. After the kidney was delivered the ureter was examined by a probe, and a small calculus pushed into the bladder. The patient made a rapid recovery and left the hospital on November 28, 1906, with the wound nearly healed. The wound closed completely two weeks later.

CASE III—The patient was a man, a patient of Dr. Alexander Lambert, who entered the hospital on March 7, 1906, complaining of hematuria which had been constant for two weeks. He had no frequency of urination, and no pain associated with the act. He complained of a dull, heavy sensation in the right loin, and while he gave no history of renal calculus he stated that

about twenty years ago he had passed on several occasions a large quantity of sand. This however was not accompanied by the passage of blood. He had gonorrhœa sixteen years ago and again twelve years ago. During the last attack he had intense pain in the right side of the back extending down the right thigh and into the testicle. He had at that time frequent urination and a right sided epididymitis and stated that his gonorrhœa was followed by a stricture which was cut internally. He had no history of cancer or tubercle.

An examination of the patient's urine showed that it was uniformly bloody. There was no residual urine. The urethra easily admitted a 26 F blunt sound and the capacity of the bladder was nine ounces. After the bladder was washed clean clear fluid injected into it became bloody within half a minute showing bleeding from the kidney. The sensitiveness of the bladder was not increased, no calculus was present. The right kidney was increased in size and palpable and there was rigidity of the right abdominal wall. Pressure over the pelvis of the kidney caused pain to radiate along the course of the ureter to the end of the penis.

A cystoscopic examination showed a slightly inflamed bladder congested in spots but free from ulceration. The left ureter was normal in appearance and discharging clear urine. The right ureter was situated in a depression surrounded by a red and ulcerated area and discharging blood and blood clots. The absence of tubercles in the urine and the presence of a large number of triple phosphate crystals made a diagnosis of renal calculus most probable with retention of urine in the kidney causing secondary phosphatic deposit.

Operation March 20 1906. The kidney was exposed by the usual crescentic incision and a transverse incision was made through the skin and inner border of the quadratus lumborum muscle this was two inches in length beginning at the point of the greatest convexity of the first incision. The amount of perirenal fat was excessive. This was grasped firmly with strong pedicle forceps and divided between them constant traction being made upon the forceps to draw the fatty capsule outside of the wound. The capsule of the kidney was adherent by numerous rather strong bands to the fatty capsule the latter was cut away as the kidney was freed by the finger. The kidney was then

delivered upon the loin. It was of a mottled bluish-white color, and was much increased in size. In the upper pole, near the pelvis, a hard nodule could be felt. No stone was detected by palpation. On drawing the kidney forward, the pelvis was seen to be very much dilated. An incision sufficiently large to admit the index finger was made with a blunt bistoury through the kidney and into the pelvis, and the pelvis and calyces were explored by the finger. The hemorrhage was completely controlled by the finger in the wound. On the margin of this incision into the kidney there was a yellowish area which was in marked contrast to the purple congested surface of the cortex, a portion of this was cut out and on close inspection showed a number of small miliary spots which were regarded as tuberculous. The kidney was then removed, after tying off the pedicle with No. 2 chromicized catgut. The pelvis of the kidney was opened, and a bougie-a-boule passed into the bladder, which showed that the ureter was patent throughout its course. It was ligated with No. 2 chromicized catgut. The renal vessels were then grasped with a pedicle clamp on the distal side of the ligature, and divided with scissors, the ureter was then divided, a second ligature was then placed around the renal vessels and the clamp removed.

The kidney pelvis was found to be the seat of numerous ulcerations, surrounded by a zone of ecchymosis. Miliary tubercles were found in the pyramids, and the hard nodule near the upper pole proved to consist of a collection of small nodules, many of which were undergoing cheesy degeneration.

CASE IV — *Multiple miliary abscesses of the kidney secondary to multiple prostatic abscesses. Perineal prostatectomy followed by nephrectomy. Recovery.* The patient was a physician, 24 years old, who was operated on May 3, 1906, for gangrenous appendicitis. The following September he infected his hand while operating, and as a result of this suffered from general sepsis. A month later he had an attack of typhoid fever lasting six weeks. In January, 1907, he contracted a urethral discharge which at first seemed a trivial matter, but in the course of two weeks numerous foci of suppuration developed in his prostate, together with a profound sepsis. On February 8, 1907, perineal prostatectomy was done, both lateral lobes being removed. These were the seat of multiple abscesses, the largest containing about half an ounce of pus. On the following day the perineal drainage

tube was removed. On February 16 the left epididymis became inflamed. On the 17th the patient complained of severe pain in the region of the right kidney but as his temperature was normal the pain was attributed to the epididymitis. On the 18th the patient was sitting up in a chair with a normal temperature. On the 21st two weeks after operation nearly all of his urine was voided through the urethra. Two days later about two o'clock in the morning he was seized with acute general pain in the abdomen which gradually became circumscribed in the region of the right kidney. The patient was nauseated and expelled much gas. At 8.45 A.M. the same day he had a severe chill pain in the region of the right kidney continued and the patient vomited clear fluid. At 2.45 P.M. he had another chill and vomited a dark green fluid. Examination of the abdomen showed rigidity on the right side. There was severe pain on pressure over the kidney and also in the lumbo-costal region. His temperature however did not go above 98 until the second day of the attack when it reached 102. On February 25 he had another severe chill and an operation on the kidney was determined. A nephrectomy was thereupon done and the patient made a slow recovery.

The four patients when presented were in perfect health and the scars resulting from the operations were firm small and there was no weakening of the abdominal wall.

### TRAUMATIC EPILEPSY

DR. GEORGE E. BREWER presented a man of 30. Thirteen years ago he fell and sustained an injury to the right side of his head. Some five years after this injury he began to have epileptiform attacks. These at first occurred every five or six months but later became more frequent and during the past three months they had been repeated several times a day unless controlled by bromides.

The patient was admitted to the Roosevelt Hospital for observation and it was found that the attacks began by convulsive movements on the left side of the face and arm afterwards extending to the left leg and finally becoming general. On the advice of Dr. L. Pierce Clark an osteoplastic resection was made over the right motor area. On removing the dura a thickened mass was found posterior to the Rolandic fissure which on further examination was found to contain a small fragment of bone which had evidently been driven through the dura and



into the substance of one of the convolutions This was removed, the dura united, and the bone flap replaced The patient made an uninterrupted recovery, and while before the operation he had as many as six or eight convulsions a day, he had not experienced a single one since he left the operating table Dr Brewer said that he did not feel justified, however, in offering a favorable prognosis, as the epileptic habit had been established for such a long time He presented the case merely as one in which a definite lesion had been found

DR GEORGE WOOLSEY said that these operations were frequently done without finding anything He recalled one successful case, which was already on record, where he found a spicula of bone projecting through the dura and surrounded by a cyst According to the location of the lesion described by Dr Brewer, it must have been behind the motor area in the sensory area, and was in corroboration of the view that a lesion of the sensory area might give rise, in a reflex manner, to epileptic disturbances The speaker said that a case of idiopathic epilepsy of the Jacksonian type, of many years' duration, without any history of trauma, recently came under his observation, in which the attacks began by convulsive movements of the left hand He exposed the motor area and with a single wire electrode was able to locate the hand centre in the precentral convolution, but there was nothing found here to account for the epilepsy The question arises whether the cause of the irritation in this case also may have been in the sensory area, but as this is extensive and regional localization in it is not so accurately known, operation could not be so intelligently undertaken as in the motor area

DR BREWER, in reply to a question, said that electrical stimulation of the exposed brain area was not resorted to in his case He had asked Dr Clark what had led him to predict the presence of a lesion posterior to the motor area, and he said that he had based his opinion upon the following reasons 1 That after thirteen years' existence, a motor lesion of sufficient size to produce such violent disturbance would probably have resulted in some paresis by this time 2 That the epilepsy still retained its focal type This fact had often been observed in cases where the lesion was a little remote from the motor area 3 That not infrequently the lesion in these cases was in the sensory area, the motor explosion being simply a secondary affair.

## TRAUMATIC RUPTURE OF THE PANCREAS

DR. GEORGE E. BREWER presented a girl eight years old who had sustained a severe contusion of the epigastric region from a fall. The injury was followed by symptoms of profound shock and when she was brought to the Roosevelt Hospital she seemed almost in a state of collapse with feeble shallow respirations great pallor cold perspiration and an almost imperceptible pulse. The condition was such as to preclude the thought of operation for the time being. She was placed in bed surrounded by hot water bottles and stimulating measures were applied. She rallied slowly and on the following day presented the following condition: Mind clear pulse 130 temperature 99.5 abdomen distended rigid and tender to palpation in the epigastric and left hypochondriac regions. There was evidence of free fluid in the peritoneal cavity but no gas. The urine showed two and a half per cent of sugar. The case was regarded as one of a visceral lesion and under ether anesthesia an incision was made through the left rectus muscle. The spleen was found slightly fissured along its anterior border but the chief source of hemorrhage seemed to be in the region of the tail of the pancreas. This for an area about the size of a silver half dollar was crushed and as soon as the blood clots were removed it bled freely. There was considerable ecchymosis of the surrounding tissues particularly in the colon and the transverse mesocolon in which there was a ragged tear. A mass of handkerchief gauze was packed over the bruised area the distal end of which was allowed to protrude through a counter-opening near the anterior extremity of the 12th rib. All fluid and clotted blood was removed by flushing the abdominal cavity with normal salt solution. The original wound was closed tightly. The patient made an uninterrupted recovery.

In reply to a question Dr. Brewer said that sugar was only present in the urine for one day. There was no necrosis of the wound but the wound where the gauze was inserted healed very slowly.

HYDATID CYST OF THE LIVER WITH LIGATURE OF  
THE PORTAL VEIN

DR. GEORGE E. BREWER presented a woman 38 years old who was admitted to the Roosevelt Hospital suffering from an

epigastric tumor with periodic attacks of pain in the right hypochondriac region Previous history negative Three months before admission, the patient had suffered from an acute attack of pain in the region of the gall-bladder, associated with nausea and vomiting Following this attack there had been a slight jaundice, which soon disappeared Since that time the patient has suffered from similar attacks on a number of occasions, the pain, however, being more centrally located, and the point of greatest tenderness being just beneath and to the right of the ensiform

On examination, an oval, elastic tumor was easily palpated in the mid-line, midway between the ensiform and the umbilicus The tumor was deeply seated, apparently fixed to the deeper structures, and was moderately tender to pressure The diagnosis rested between an echinococcus cyst of the left lobe of the liver and an abnormally located gall-bladder An incision was made under general anesthesia extending from the ensiform to a point one inch below the umbilicus When the peritoneal cavity was opened, a large oval mass was seen presenting in the mid-line and pressing upward the gastro-hepatic omentum and stomach The gastro-hepatic omentum seemed thickened and highly vascular A distinct sense of fluctuation could be felt within the tumor, which was apparently fixed to the inferior surface and posterior border of the liver The right free border of the lesser omentum was felt, and the duct and hepatic vessels palpated To avoid these structures, an incision was made through the gastro-hepatic omentum, exactly in the mid-line of the body, over the centre of the tumor, which exposed a smooth gray structure, which was supposed to be the fibrous envelope of the tumor A large exploring needle was introduced through this fibrous structure, and clear fluid withdrawn On withdrawing the needle, an active hemorrhage took place from the small opening On attempting to control this by hemostatic forceps a larger rent was made, which resulted in a very copious flow of dark colored blood The hemorrhage was temporarily arrested by digital pressure, and, dissecting away the superficial tissues, it was found that the structure which was supposed to be the fibrous capsule of the tumor was in reality a large vein, nearly 1 cm in diameter, passing upward from the region of the pancreas to the transverse fissure of the liver The calibre of the vein had evidently been much encroached

upon by the growth of the tumor over which it passed in a flattened and ribbon like condition. The vein from the upward pressure of the tumor was under a good deal of tension and its walls were exceedingly friable. Two careful attempts to suture the wound were made with fine silk and a minute round needle. As soon as the pressure was removed and blood coursed through the vessel the stitches were torn out and the hemorrhage recurred. The vessel was finally doubly ligated above and below the seat of injury.

As it was impossible to remove the tumor and as it was impossible to bring it to the surface of the wound in such a manner as to unite its fibrous capsule with the abdominal wall after packing off the intestines and all of the surrounding peritoneal space with a large mass of handkerchief gauze the cyst was freely opened and its fluid contents syphoned off. After this the gauze was removed and a large rubber drainage tube was securely sewed into the cyst opening. This was surrounded by a small mass of gauze packing which extended from the surface of the tumor to the abdominal wall. The wound was closed with the exception of that point through which the tube and packing emerged. The operation was a long one and was followed by a considerable reaction. The temperature rose on the following day to 103 and later to 104. The pulse was very rapid but of good quality. The patient suffered only slight pain and was soon able to take food in abundance.

The first dressing occurred on the third day when the cyst was irrigated with normal salt solution and a large amount of cloudy fluid and daughter cysts removed. At the second dressing two days later the cyst was washed out with a solution of nitrate of silver 1-8000. This was repeated every day the strength of the solution being gradually increased until 1-2000 was employed. The result of this was to cause a marked shrinkage and opacity of the daughter cysts which were washed away and continued to appear in the washings for some three weeks. The packing surrounding the tube was removed during one of the early dressings but the tube was retained for five or six weeks until the amount of secretion from the cyst cavity had been reduced to a very small amount. The wound was then allowed to heal by granulation. The temperature remained between 101 and 104 for three weeks and then gradually came

down to normal With this exception the patient presented absolutely no signs of illness or interference with normal nutrition In fact, she had gained steadily in weight and color, and from being an anæmic and emaciated invalid had grown into a robust and healthy woman The urine and other excreta have been carefully examined from time to time by Dr W J Gies, Director of the Department of Biology of the College of Physicians and Surgeons, who reports no departure whatever from the normal

The only explanation of this failure to observe marked changes in the nutrition of the patient seems to the writer to be that in the gradual growth of the tumor from below upward, the portal vein was carried away from its normal position toward the mid-line, and as a result of increasing pressure and the associated stretching of the vein, its calibre became gradually reduced and the collateral circulation was thereby established, which at the time of operation was so near complete that the diversion of the small amount of blood which was then passing through the obstructed vessel caused no perceptible increase in symptoms This theory was strengthened by the fact that in the first incision one or more very large subcutaneous veins were encountered in the region of the umbilicus, such as were often found in advanced cirrhosis of the liver, or after Narath's operation

#### SEPARATION OF UPPER EPIPHYSIS OF HUMERUS WITH DISLOCATION

DR ELLSWORTH ELIOT, JR, presented a boy, 14 years old, who was admitted to the Presbyterian Hospital on October 27, 1907, with the history that sixteen days before he had been knocked down by an automobile He was unconscious for a time Shortly after the accident, upon regaining consciousness, he complained of pain and disability in the right shoulder The case was regarded as one of dislocation, and prior to his admission to the hospital two unsuccessful attempts had been made by the family physician to effect reduction under anesthesia An examination revealed the fact that there had evidently been a separation of the upper epiphysis of the humerus, with displacement downward An X-ray was taken, which showed the position of the head of the bone and the fact that the line of fracture corresponded very closely to the epiphyseal line

The joint was exposed through a Y-shaped incision, one arm

of which passed through the deltoid just below the acromion process the other through the clavicular portion of the pectoralis major Dr Eliot said he had used this in a number of cases It did not interfere with the nerve supply of either muscle and gave an admirable exposure When the parts were retracted it was found that the capsule of the joint was intact the upper fragment could be distinctly felt within the capsule and a few fibres of the latissimus dorsi were still attached this together with gravity had displaced the head of the bone downward below the inferior lip of the glenoid cavity

The upper end of the fragment was then exposed and an attempt made to correct the deformity With the arm abducted this was quite possible but when an attempt was made to extend the arm the deformity recurred The fragments remained in perfect apposition however with no tendency to displacement when the arm was abducted to 45 degrees

The wound was closed and the arm placed in a position of abduction of about 45 degrees an extension apparatus of about five pounds was applied and kept in place three weeks At the end of that time union was sufficiently advanced to prevent a recurrence of the deformity and the arm could be placed in the ordinary position by the side of the bed About this time the patient developed an attack of catarrhal appendicitis of which he had had several previous attacks and the appendix was removed He was discharged cured on December 13 1907 The operation on the shoulder joint was done on Nov 1 and the functional result at the present time is practically perfect

In connection with this case Dr Eliot exhibited an X ray picture which still showed a slight amount of displacement with the head of the bone in the glenoid cavity

DR. ROYAL WHITMAN said that he had hoped to present a patient illustrating a perfect functional result after separation of the upper epiphysis of the humerus whom he had treated by a method which he thought should be more effective than that usually employed The fragments having been separated by manipulation the diaphysis was apposed to the epiphysis by traction and abduction using the acromion if need be as a fulcrum The arm in extension and full abduction was then raised to a position nearly parallel to the body line and fixed by means of a plaster bandage until consolidation was assured In Dr Eliot's

case, although perfect adjustment of the fragments had been attained by the open operation, yet partial displacement had recurred afterwards. This was illustrated by the X-ray picture and demonstrated by the marked limitation of the range of abduction.

In reply to a question by Dr Eliot, whether the method he had described could be successfully applied two weeks after the injury, Dr Whitman said it should at least be tried, then it might be supplemented by the open operation if the fragments could not be disengaged.

Dr Whitman said the aim of abduction was to approximate the upper fragment to the lower, the arm was raised above the head because it might be more conveniently fixed in this attitude. In the case presented, function should be improved as the irregularities at the site of the injury were lessened by the developmental changes. It would be, however, of advantage if primary and more accurate adjustment were possible because in some instances even comparatively slight displacement of the epiphysis had resulted in loss of growth.

DR F KAMMERER said he recently saw a woman, about 40 years old, who on December 24, 1907, sustained a sub-coracoid dislocation and a fracture of the surgical neck of the humerus on the same side. Six days after the injury, under anesthesia, the speaker said he was able to reduce the dislocation without operation. After several unsuccessful attempts to effect reduction by moderate traction on the lower part of the humerus and direct pressure on the head toward the cavity, and when he had practically made up his mind that an open operation would be necessary, he finally succeeded by manipulations. The four fingers of the right hand, excluding the thumb, could be passed around the head of the humerus with great ease, when muscular relaxation was perfect, and thus firm traction could be exerted.

DR BREWER said that about a year ago he saw a case of this kind ten weeks after the injury in which the X-ray showed practically the same state of affairs as those described by Dr Eliot, namely, deformity, epiphyseal separation and downward displacement. He did an open operation, and found, as Dr Whitman had said, that by raising the arm the deformity was reduced, while bringing it down tended to cause separation of the frag-

ments The speaker said that in his case a second operation became necessary and at that time the arm was kept in the upright position for six weeks and a perfect functional result obtained

DR. ELIOT in closing said that in his case abduction was still improving and he thought there was a fair probability of its complete restoration The patient was now able to abduct the arm to about 60 degrees At the time of operating the reduction of the deformity required considerable traction because of the displacement of the head of the humerus downward

### OPERATION FOR UMBILICAL HERNIA

DR CHARLES N DOWD presented a woman 45 years old who was admitted to the General Memorial Hospital in November 1906 She had been suffering from a large umbilical hernia for fifteen years The hernial mass was about 8 inches in diameter and could not be reduced There were various apertures in the fibrous portion of its wall A gurgle could be distinctly heard on effort at reduction

She was put on a restricted diet in the hospital given saline cathartics and instructed to walk about the hospital corridors for a considerable period each day and in this way her weight was reduced five pounds by December 5 but no success was met with in reducing it beyond that point

Dr Dowd operated on December 12 1906 dissecting back the skin and subcutaneous tissue and laying bare the fascia about three inches from the umbilical ring On cutting through the hernial sac to which he left a transverse ellipse of skin attached he found that the contents of the sac were almost entirely intestine with a thickened mesentery which contained a large amount of fat There was hardly any omentum present and what there was was adherent both to the sac and to the intestine in such a way as to make it impossible to dissect any large portion of it away The adhesions between the intestine and the wall of the hernia were dissected away It was impossible to avoid injuring the intestinal wall somewhat in this procedure and two or three catgut purse string sutures had to be taken The amount of intestine which protruded through the ring would just about have filled a derby hat and it was with the utmost difficulty and no small amount of force that they were returned into the abdomen The transverse colon was the portion of intestine most involved



The gap in the abdomen was closed by the Mayo overlapping method, with kangaroo tendon and chromic gut. There was some vomiting and prostration after the operation, but on December 15 gas and feces were passed. On that day her pulse was 80, temperature, 100. She still had a tendency to vomit, but looked well and made an uninterrupted recovery.

Dr Dowd said there was no question about the value of the overlapping method of treating umbilical hernia—he had used it many times but this particular case furnished the most severe test of the method which he had seen.

### NECK INCISIONS AND NERVE INJURIES

DR CHAS N DOWD presented three cases showing the effects of injury to the spinal accessory or lower filaments of the facial nerve, stating that these nerves had frequently been injured in neck operations with the feeling that the ill effects were usually temporary, and in any case were not very important. These cases had recently come to his notice and illustrated what might be expected from these injuries in certain instances.

He also showed three cases illustrating the difference in the results of longitudinal and transverse scars in the neck. Neck scars were so much dreaded that patients often postponed or avoided operations which were really needed, and although thoroughness of operation was the main desideratum, if that thoroughness could be accomplished through a transverse incision, the welfare of the patient was promoted since transverse incisions seldom stretch while longitudinal ones usually do.

CASE I was admitted to St Mary's Hospital in March, 1898, about ten years ago. She was then five years old and had enlarged lymph nodes and numerous abscesses for three years. She also had a large mass of nodes and many cicatrices on the right side of the neck. An extensive dissection was done, and the sterno-mastoid muscle was cut above the entrance of the spinal accessory nerve, and the nerve was also divided. The portion of the nerve which supplied the sterno-mastoid muscle failed to unite, and there was an atrophy of that muscle. The trapezii, however, were normal, possibly because the nerves of the cervical plexus were sufficient to supply the muscle. She had very little shoulder droop and moved her head perfectly well. The change in the contour of her neck was the principal ill-effect which had followed the injury.

She was entirely free from recurrence and had made an excellent recovery

CASE II was admitted to St Mary's Hospital on March 7 1898 when he was eight years old. He had for two years suffered from tubercular cervical lymph nodes with abscess formation. In the course of the dissection which was very extensive the posterior branch of the spinal accessory nerve between the sternomastoid and the trapezius was divided. Ten years after the operation he had a partial atrophy of the trapezius which was about one-quarter the size of the other. The shoulder blade set higher than the other and was rotated so that the lower angle projected backward and the upper angle projected upward and forward at the trapezius border. The shoulder drooped and was also carried forward. This shoulder was not as strong as the other but he was able to work as a brick layer and said that he was not incapacitated for his work or for carrying weights. The right pectoralis was atrophied and the motions of his chest were much less marked on the right than on the left side. He had no return of tuberculosis.

CASE III was first admitted to St. Mary's Hospital on December 26 1896 with the history of having had repeated operations at various times for very extensive cervical tuberculosis. The glands at one time or another had filled in the tissues all the way from the parotids to the scapulae and in the process of the various dissections which were necessary the collo mandibular ramus of the facial nerve was cut with resulting deformity of the mouth. This was due to paralysis of the depressor labii inferioris there was a failure in the drawing down of part of the lower lip which caused asymmetry in speaking smiling etc. The injury of this nerve was often said to be temporary but it was sometimes permanent as illustrated by this case.

CASE IV—This boy who was admitted to St Mary's Hospital in 1905 at the age of three years illustrated the effect of removal of the lymph nodes through a transverse incision. He had been suffering from enlargement of the lymph nodes for ten months and the operation was an extensive one. The masses of nodes which were removed were as large as a small sized bunch of grapes. He had remained free from recurrence up to the present time and the scar on the neck was scarcely perceptible.

CASE V who was admitted to the General Memorial Hospital

on February 26, 1907, showed the result of a similar operation on a man who had enlarged lymph nodes for a year. The nodes were extensive, requiring a large incision. At the present time, eleven months after the operation, he was free from recurrence and the scar was hardly visible.

CASE VI illustrated the result of a longitudinal scar which was made fifteen months ago for the dissection of nodes which were particularly abundant in the posterior chain. Although the underlying fascia was united so as to raise the incision line in a ridge, there was still a stretching of  $\frac{1}{2}$  to  $\frac{3}{4}$  inch in the resulting scar. This incision was curved forward at its lower end and in this transverse part there was no stretching.

DR CHARLES A. ELSBERG, in speaking of injury to the mandibular branch of the facial nerve, said the resulting paralysis from this accident was usually temporary. In two of his cases, both young women, in whom it occurred and remained for some time without signs of improvement, he resorted to the subcutaneous division of the corresponding branch on the opposite side. The loss of function from the injury was insignificant, and by dividing the opposite branch the slight deformity became symmetrical and less noticeable.

DR ALFRED S. TAYLOR said that in one of the cases shown by Dr. Dowd, where the injury to the spinal accessory nerve had produced considerable deformity, it might be advisable to dissect out both ends of the divided nerve and suture them.

DR DOWD said he had not seen some of these cases for several years after the original operation, and he doubted whether suture of the nerve would be serviceable after such a long period had elapsed.

DR TAYLOR said that cases were on record in which suture of the nerve 29 years after the injury had been followed by nerve regeneration and return of muscular power.

#### SUBPHRENIC ABSCESES

DR ALEXANDER B. JOHNSON presented a woman, 27 years old, who was admitted to the hospital with the history of a typical attack of acute appendicitis which had lasted one week. The signs and symptoms of generalized peritoneal irritation and of sepsis were well marked. Upon operation, gangrenous appendicitis and gangrene of the right ovary with diffuse peritonitis

were found. On the fourth day the patient had a severe chill and a rise of temperature to 105. During the following 48 hours the physical signs and symptoms of right subphrenic abscess developed. The abscess was approached by resecting the ninth rib and suture of the parietal and costal layers of the pleura. A large amount of foul pus was evacuated from between the liver and the diaphragm. The patient made a slow but perfect recovery during the next three months. She left the hospital ten days ago. It was interesting to note that the left ovary also became gangrenous and was discharged as a slough through the drainage opening which had been made in the vagina. The patient has not menstruated since.

DR. JOHNSON also presented a man 30 years old who was admitted to the hospital with the signs and symptoms of acute appendicitis 48 hours after the beginning of the attack. Operation showed a gangrenous appendix with perforation and diffuse peritonitis. Ten days later an abscess situated in the left lower quadrant of the abdomen was incised evacuating eight ounces of pus. Five weeks after the original operation signs and symptoms of a right subphrenic abscess developed. The ninth rib was thereupon resected and after suture of the costal and parietal pleurae one quart of pus was evacuated from between the liver and the diaphragm. The patient made a slow but complete recovery.

DR. JOHNSON in reply to a question as to whether he made his incision through the diaphragm at once or subsequently said that in one of the cases he had shown he had opened the diaphragm at once and in the other he did not. In several instances where he had operated for abscess of the liver he had found that the two layers of the pleura showed no tendency to separate even though not adherent. In one of the cases of subphrenic abscess he had shown the incision through the diaphragm was made at once and there were no indications that air had entered the pleural cavity. In the other case he allowed an interval of 36 hours to elapse before incising the diaphragm. If the two layers of pleura were found infiltrated and adherent there could be no question about the propriety of immediate incision. If the diaphragm bulges up against the pleura no air will enter upon incising the costal layer if on the other hand the border of the lung can be seen moving freely up and down it will be safer to suture the

two layers and make the incision through the diaphragm after 24 or 36 hours

DR CHARLES H PECK said that during the past summer he had operated on two cases of subphrenic abscess, one primary, the other following appendicitis, and in both he succeeded in getting good drainage by making an incision, resecting a portion of the costal cartilages in the mid-axillary line, and getting into the abscess below the pleural reflection without finding it necessary to go through the pleura. In a third case he did the same thing on the left side.

#### FRACTURE OF THE FEMUR OPENING INTO THE KNEE JOINT

DR ALEXANDER B JOHNSON presented a man, 30 years old, who fell a distance of thirty feet with a ladder, striking upon his flexed knee. Upon admission to the hospital, examination showed the right knee flexed to an angle of 90 degrees. Active movement was impossible, and passive movement was very much restricted and painful. The knee was greatly swollen, and the condyles of the femur, together with the leg, were displaced backward. The sharp lower end of the upper fragment of the femur formed a marked projection upon the anterior aspect of the limb above the knee.

An immediate vertical incision near the middle of the anterior aspect of the thigh exposed the fractured femur opening into the knee joint. The lower extremity of the upper fragment of the femur ended in a sharp point beveled at the expense of the posterior surface. The condyles of the femur were separated by a line of fracture in the middle line, vertical in direction. A considerable fragment of the femur was found loose above the condyles and behind the lower end of the shaft, and was extracted. The lower end of the sharp fragment was sawn horizontally two inches from its lower extremity in order to furnish a flat surface for apposition with the condyles. The condyles were then drilled, and sutured together with chromic gut and the knee joint flushed with salt solution. The condyles were brought into apposition with the lower end of the upper fragment, and rubber tissue drainage extending to the point of the fracture was inserted. The entire limb, including the pelvis, was then covered with plaster-of-Paris dressing. Primary union resulted. The bones were

firmly united at the end of the tenth week when the patient was allowed to walk in a light plaster dressing. At the present time five months after the accident the patient was able to use the limb without pain. Flexion is possible to more than 30 degrees. There is  $1\frac{1}{2}$  inches measured shortening. The amount of lateral mobility in the knee was slight. The amount of flexion was increasing.

DR. JOHNSON said the production of the fracture in this case was rather interesting. The man was quite certain that the injury was caused not by the impact on the ground but by a twist of the leg through the rungs of the ladder just as the latter reached the ground. Personally the speaker said he was inclined to believe that the injury was produced by the direct fall upon the lower end of the femur. There were no contusions on either side of the knee such as one would expect from direct violence of any sort.

#### ON THE THYMUS GLAND TREATMENT OF CANCER.

DR. FREDERICK W. GWYER read a paper with the above title for which see page 506.

DR. GWYER in reply to a question as to why he had selected the thymus gland for this purpose said that after experimenting with several of the glandular extracts among them that of the pancreas without any encouragement it occurred to him that cancer of the thymus was almost unknown that the disease was very rare in youth when the thymus gland was prominent and that it was such a common disease of old age after the practical disappearance of the gland. He would prefer not going further into the details of his theories regarding cancer and its treatment at this time but make it the subject of a future paper.

# TRANSACTIONS

OF THE

## PHILADELPHIA ACADEMY OF SURGERY.

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*Stated Meeting, January 6, 1908*

The President, JOHN B ROBERTS, M D , in the Chair

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### GUNSHOT WOUND OF STOMACH, WITH POSTERIOR DRAINAGE

DR EDWARD B HODGE, JR , presented a man, aged 19 years, who was admitted to the Presbyterian Hospital on November 12, 1907, in the service of Dr J H Jopson Two hours before he had been accidentally shot with a BB bullet from an air rifle from a distance of 100 feet The bullet penetrated a wire screen-door, shirt and undershirt, making a small wound 2 inches below the ensiform slightly to left of median line Patient had taken no food for 5 or 6 hours, had not vomited and was in good condition Temperature, 98.8°, pulse, 84, respiration, 26

Immediate operation by Dr Hodge Incision through wound showed penetration through left rectus ranging toward left A perforation in anterior wall of stomach near lesser curvature and nearer cardiac than pyloric end was closed with silk purse-string suture, reinforced by interrupted silk Lemberts Little soiling of peritoneum Air and blood were noticed behind gastro-colic omentum This structure was torn through, and a perforation found on the posterior wall of the stomach toward the cardiac end This was closed in a similar manner No other injury could be found, but in view of the wound of the posterior stomach wall and a possible pancreatic lesion, posterior drainage was considered wise Through a small incision in the left ileo-costal space a long forceps was pushed into the lesser peritoneal cavity and a medium-sized rubber tube withdrawn The gastro-colic omentum was closed over this after dry sponging of the peritoneum A small cigarette drain was inserted to the anterior stomach wound and both incisions closed with interrupted silk-worm gut.

For 24-36 hours the patient gave considerable anxiety on

account of marked restlessness rapid pulse 130-160 and respiration 30-40 with some distension of the upper abdomen After the second day convalescence was smooth On day after operation there were 3 dark tarry stools and for 10 days 1-3 of similar though lighter color Tube was gradually shortened on account of moderate purulent discharge Stitches removed on tenth day and patient discharged in 4 weeks

DR GEORGE G ROSS said that several years ago at the Germantown Hospital he saw an Italian who had been shot The ball went in the lower chest wall between the lower ribs ranged downward and inward The skiagraph showed the bullet resting against the vertebral column The man was shot when his stomach was absolutely empty There was reason to believe from his bowel movements that the bullet had gone through both walls of his stomach He absolutely refused operation He developed quite a cough and violent peritonitis but finally got well without operation or drainage Dr Ross believes that there was a reasonable doubt as to perforation of the stomach although it was thought there was from the clinical facts

#### STAB WOUND OF THE DIAPHRAGM

DR. FRANCIS T STEWART reported the case of a man aged 22 years colored who was admitted to the Pennsylvania Hospital December 14 1907 in the service of Dr Gibbon The patient had been stabbed in the left mammillary line with a penknife which entered the sixth interspace cut through the seventh costal cartilage obliquely downward and outward and severed the muscles of the seventh interspace the resulting wound being 3 inches in length Through this wound protruded a portion of the stomach about the size of an orange The pulse was 100 the temperature normal and the respiration quiet There was considerable pain in the region of the wound rigidity of the left side of the abdomen but no vomiting displacement of the heart or pneumothorax Under ether anesthesia an incision was made through the left rectus abdominis That portion of the stomach which protruded through the external wound was then pushed into the thorax and the opening plugged with gauze in order to prevent the entrance of air The stomach was then drawn upon from the abdominal cavity but owing to the negative pressure in the thorax reduction was found to be rather difficult until assisted by pressure from above through the thorax The stomach was un



injured and there were no other visceral lesions. The hole in the diaphragm was about  $2\frac{1}{2}$  inches long and ran in the direction of the muscular fibers, from the pericardium downward and outward. After pushing the diaphragm upward with the hand in the abdomen the wound in the diaphragm, the edges of which were about  $\frac{1}{4}$  of an inch in thickness, was sutured, through the seventh intercostal space, with catgut without resecting a rib. The severed costal cartilage and the intercostal muscles were sutured with catgut, the skin with silkworm gut, no drainage was employed, and the diaphragmatic region was immobilized with adhesive straps. During the operation some air entered the thorax, but later there was no displacement of the heart and only a slightly higher pitch in the percussion note over the thorax. The lung was neither seen nor felt during the operation. The following day there was some pain and slight dyspnoea, both of which subsided in the course of 48 hours. The wounds healed by primary intention, and the patient left the hospital on the sixteenth day.

DR JOHN N GIBBON recalled a case of his own at the Pennsylvania Hospital several years ago, that of an Italian who was stabbed in the back and when he was seen by Dr Gibbon shortly after the injury there was protruding through a wound at the lower angle of the scapula quite a mass of omentum, as large as three or four fingers. In this case Dr Gibbon resected a rib, ligated and removed a portion of the omentum, returned the stomach to the abdominal cavity and closed the diaphragmatic opening. The knife the patient was stabbed with was a small one which passed between the ribs, and one rib acting as a fulcrum the knife cut a  $2\frac{1}{2}$  inch opening in the diaphragm. Dr Gibbon opened the abdomen because he was afraid there might be an injury of the stomach but nothing was found and the abdominal wound was therefore closed. The patient did well for 24 hours but then developed a double pneumonia, and the man died 6 or 7 days after the receipt of his injury. An autopsy was performed and the pneumonia on the side where the patient had been injured was found to have practically subsided. His wound had completely healed and the active process was all on the opposite side.

DR HARRY C DEVER said that in subdiaphragmatic abscesses complicating appendicitis he had resorted to drainage by resecting the tenth rib posteriorly and making the incision in

the diaphragm stitching it to the muscles of the chest wall. He has found this very successful and also that it gives good drainage. Subdiaphragmatic abscesses are very hard to drain. In the last case upon which he operated relieving the abscess in the way described he depressed the liver and ran a large drainage tube between it and the diaphragm. This drained very nicely and there was no unpleasant results from stitching the diaphragm to the muscles of the chest wall.

DR. JOHN B. ROBERTS said that a good many years ago when he did his first nephrotomy he punctured the diaphragm by accident. He could hear the whistling of the air in the chest. The patient however recovered satisfactorily.

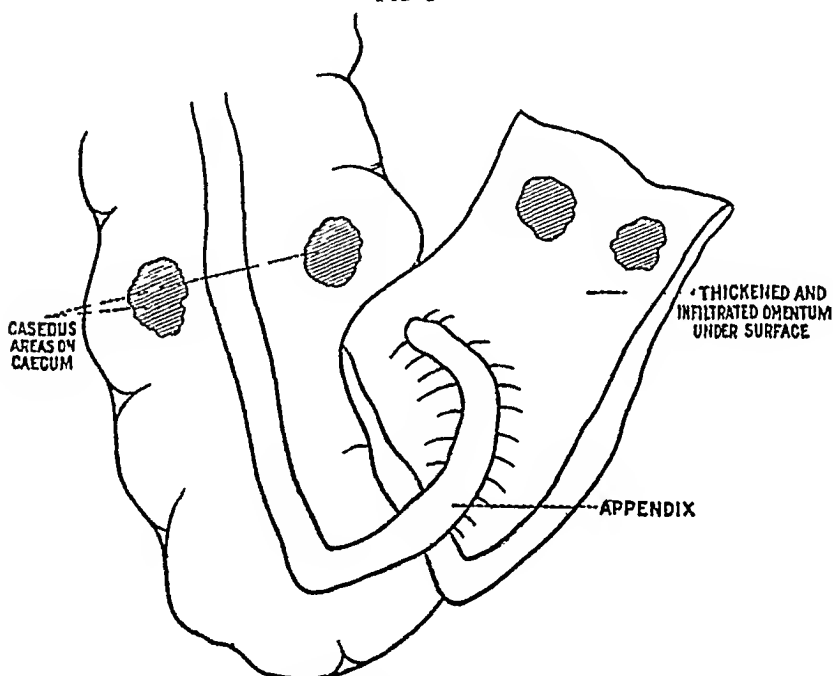
#### PRIMARY TUBERCULOSIS OF THE CÆCUM

DR. JOHN H. JOPSON reported the case of a man aged 26 years who was admitted to the Presbyterian Hospital October 14 1907. His family history was negative. Six weeks before admission he had been knocked down by a horse and a wagon ran over him the wheel passing over the left thigh just below the hip and across the right iliac fossa. He had considerable pain in the abdomen and in the left hip which lasted about three days when he returned to light work. Pain continued but of mild degree until a week later when he attempted heavier work and from that time he suffered more severely until 2½ weeks before admission when he had to quit his work. He then detected a mass in the abdomen which he thinks has increased in size and since then has become the seat of increasing pain. Three weeks before admission he says he passed blood by the bowel for three days. Since then there have been daily bowel movements some times loose sometimes constipated. He has only vomited once. His appetite has been poor and his only nourishment of late has been milk. Previous to his injury he had been in good health.

On admission his temperature was 100 pulse 120 respiration 28. He was in good condition well nourished although of rather spare physique nothing of note in the chest. There was a mass in the right iliac region about the size of a small orange moderately sensitive and the seat of pain. Leucocyte count 18 100. His temperature fell below normal the day after admission and continued below normal between 97 and 98. The pain and tenderness lessened and the mass decreased apparently in size. On the 21st one week after admission the leucocyte

count was 14,000, and three days later 9,700    Operation October 25, 1907    Incision over the tumor showed it to be intra-peritoneal    The mass was formed of a portion of the end of the large omentum, overlying and adherent to the anterior wall of the cæcum, and the entire mass was fastened to the peritoneum over the inner wall of the false pelvis    The cæcum and adherent omentum were peeled off, which disclosed a few caseous areas on the underlying peritoneum    The omentum was stripped from the cæcum to the anterior surface of which it was adherent    Examination

FIG 1



Primary tuberculosis of cæcum    In this sketch the diseased portion of omentum has been separated and turned over, showing the relationship of the appendix

of the under section of the portion of omentum so liberated showed the appendix adherent to it, small, short, and stripped of its peritoneal coat    Two caseous areas, about  $\frac{1}{3}$  inch in diameter, marked points on the cæcum adhesion (Fig 1)    The rest of the peritoneal coat of the cæcum was inflamed and thickened    There was no gross enlargement of the cæcum, however, and the neighboring intestines were normal in appearance    The adherent omentum was much thickened and altered in appearance, for a distance of  $2\frac{1}{2}$  inches by  $1\frac{1}{2}$  inches, and was  $\frac{3}{4}$  of an inch in thickness    It was ligated from the rest of the omentum,

and removed with the appendix fastened to it after ligation of the base of the appendix Iodoform gauze strips were packed over the raw surfaces and the wound partially closed

Convalescence was uninterrupted and the wound was healed in about three weeks The temperature remained normal and no induration was present beneath the scar Pain was entirely relieved Careful physical examination before discharge was practically negative There was a slightly duller note and some increase in tactile fremitus over the right apex but no rales He gained weight and strength and was discharged in good condition

Careful examination of the excised omentum showed on microscopic examination a caseating tuberculous infiltration This was confirmed by microscopic study Serial sections of the appendix were made which from its position in the mass was suspected to be the seat of the primary infection These failed to show the presence of tuberculosis The pathological diagnosis was therefore a primary tuberculosis of the cæcum which would be included under the entero peritoneal type of Hartmann and other writers and secondary tuberculosis of the omentum The omentum had well fulfilled its function of abdominal policeman in covering over the primary focus and assisting in the prevention of more extensive peritoneal infection

Dr JOPSON added that Henry Hartmann in an address on the Surgical Forms of Ileo Cæcal Tuberculosis before the Medical Society of London December 1906 (Brit Med Jour 4-13-1907) gives a clear and concise review of the subject and an analysis of cases operated upon Charles Greene Cumston has recently covered the subject very thoroughly in connection with a report of two cases (ANNALS OF SURGERY Nov 1907) Hartmann points out that the cæcum is the commonest seat of tuberculosis in the entire intestine and that when the only portion of intestine involved it is usually a primary infection *Tuberculosis of the cæcum attacks by preference* adults between 20 and 40 years of age The cases admitting of surgical treatment are divided into the entero peritoneal and hyperplastic types In the first the cæcum and with it frequently the ileum is the seat of ulcers and around it develop secondary peritoneal inflammation adhesions abscesses and oftentimes fistulous tracts opening externally The hyperplastic type on the other hand which is the most important surgically is generally limited to the cæcum beginning near the valve and when it spreads does so

toward the colon, it is marked by an increase in size of the cæcum with great thickening of its walls, and oftentimes the formation of a fibro-adipose enveloping mass. It is commonly non-adherent, its cavity is greatly decreased in size, frequently the site of stricture, and the mucous membrane is usually ulcerated. The appendix is often involved in the inflammatory exudate, but is usually patulous. As Hartmann points out, the infection may simulate one of two commoner conditions, viz., appendicitis and malignant tumor. The first-mentioned is commoner as a symptom-complex in the entero-peritoneal form, the second in the hyperplastic variety. Appendicular symptoms are preceded in the enteroperitoneal form by symptoms of enteritis, diarrhœa, bloody stools, etc., and later the mass, with localizing symptoms of pain, tumor, etc., appears in the right iliac region. Abscesses and fistulæ form, and pulmonary tuberculosis oftentimes develops later. It will be noted how closely the symptoms in the case here reported resemble those of the typical enteroperitoneal class. The diarrhœa, bloody stools, and later developing local symptoms were all present. The history of traumatism helped to mask their importance. How much the traumatism had to do with causation of the condition is a question.

Attacks resembling sub-acute appendicitis may develop in the course of hyperplastic cæcal tuberculosis, but the symptoms in general are those of slowly developing malignant tumors, with incomplete obstruction, alternating constipation and diarrhœa, colic and digestive disturbances. A tumor is usually present, and the course of the disease is toward a fatal issue in from  $2\frac{1}{2}$  to 3 years.

Resection is the operation of choice in the hyperplastic form. In the enteroperitoneal form, where the peri-cæcal infiltration is such a prominent and early lesion, resection is generally inadvisable. Simple laparotomy has resulted in a cure when the peritoneal lesions were few in number and intestinal ulceration absent. In severe cases, or when adhesions are very extensive, the operation of intestinal exclusion, unilateral, or, in the case of fistula, bilateral, performed on the cæcum, is indicated for the enteroperitoneal type.

Hartmann analyzes 229 operations for cæcal tuberculosis with a death list of 46. Since 1900 the mortality has been but 12 per cent.

## DIAGNOSIS OF RENAL DISEASE AND SUFFICIENCY

DR. B. A. THOMAS read a paper with the above title for which see page 588

DR. JOHN H. GIBBON asked if Dr. Thomas could tell how many cases there have been of infection of the primarily healthy kidney from ureteral catheterization. It was his opinion that there was a certain amount of danger. For instance in the case of a patient with a tuberculous kidney with secondary involvement of the bladder there would be a certain amount of danger in carrying the infection into the well ureter unless the greatest care was exercised in cleansing the bladder thoroughly and in manipulating the catheter. Dr. Gibbon believes that the indiscriminate and careless use of ureteral catheters may result in injury of a perfectly healthy ureter and its corresponding kidney. He considers this a method of diagnosis which is of undoubted value but it is only one means and he thinks that if a diagnosis can be arrived at by means of a cystoscopic examination of the ureteral openings as was done in two of the reported cases it is better especially in the presence of a bladder infection.

Dr. Gibbon referred to a case of a physician who had blood and pus in his urine frequent micturition he had no abdominal symptoms no tumor or tenderness over the kidney but he gave a history of having what he thought was an attack of appendicitis which passed off. This attracted Dr. Gibbon's attention to the right kidney he used a cystoscope on his patient with very little satisfaction which he thought was due to the presence of blood. He then did a suprapubic cystotomy and found a large ulcerated area involving the right ureteral opening. The other ureteral opening was apparently normal. The bladder wound was healed in less than two weeks and Dr. Gibbon then exposed the left kidney in order to determine its condition as has been recommended by Leonard Freeman. This required only about ten minutes and demonstrated a perfectly normal kidney. The right kidney which was the seat of an extensive tuberculosis was then removed. Within 48 hours after the removal of the kidney the patient could hold his urine for quite a little time much longer than before the operation. He made a prompt recovery and before he left the hospital had to empty his bladder only once at night. At the present time the bladder function is perfectly normal and the patient has resumed active practice.

Dr. Gibbon also referred to ureteral catheterization in cases

of ureteral calculi. He recalled two instances where the ureters had been catheterized by experienced men, and in which no ureteral stone could be definitely located. In one of these cases Dr Gibbon removed a stone 18 months after catheterization, and in the other 6 months after catheterization. He believes that in these cases the X-rays are of far more value than ureteral exploration. Probably in the hands of an experienced man the use of the wax-tipped catheter might be relied upon in such cases.

DR B A THOMAS replied that personally he had never seen a case of infection that could be ascribed to catheterization of the ureters. A couple of years ago he had an opportunity to visit Zuckerkandl in Vienna, where a great deal of work is being done along this line, and he took the opportunity to ask him whether he had ever seen a case, and much to Dr Thomas' surprise Zuckerkandl replied in the negative. Dr Thomas had expected that occasionally some such condition might arise. He thinks the danger can be reduced to such a minimum by thorough irrigation of the bladder with a sterile solution and thorough asepsis in instrumentation, that it is hardly worthy of consideration.

With reference to ureteral calculus Dr Thomas said he thought that the catheterization of the ureters is probably not of so much value in the determination of this condition as the employment of various so-called chromo-cystoscopies, or the employment of the X-ray.

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#### NOTICE—ENDO-ANEURISMORRHAPHY

DR MATAS, 2255 St Charles Avenue, New Orleans, La., writes that he is compiling the statistics of operations for the radical cure of Aneurism by the method of intra-saccular suture (Endo-Aneurismorrhaphy) and will be obliged to all the surgeons who have had experience with this operation for brief reports of their cases.

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## ORIGINAL MEMOIRS

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### SUBTEMPORAL DECOMPRESSIVE OPERATIONS FOR THE INTRACRANIAL COMPLICATIONS ASSOCIATED WITH BURSTING FRACTURES OF THE SKULL\*

BY HARVEY CUSHING M D

OF BALTIMORE MD

Associate Professor of Surgery Johns Hopkins University

DEFINITE rules of procedure in the treatment of fractures which involve the cranial vault are to be found in the earliest medical writings and with but little modification have been accepted as a part of our modern practice. These precepts are chiefly concerned with the reduction of deformations of the skull which have resulted from fragmentation of one sort or another at the pole of impact

It is otherwise with fractures involving the cranial base for beyond an ice cap recumbency and free evacuation of the bowels the surgeon's attitude toward these patients if he is interested at all lies in the making of a diagnosis to determine if possible into which fossa the lines of fracture have run in the observing of symptoms to see if by chance there is a free interval interpreted as an indication of meningeal

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\* Read before the Southern Surgical and Gynecological Association  
New Orleans Dec 1907



hemorrhage, and in the giving of a prognosis which, according to Bergmann's dictum, is good—for life, though not necessarily for subsequent health—if the patient survives the first two days following the injury

As a matter of fact, though we speak of a well-recognized class of injuries as fractures of the base—a term which conjures up a definite clinical picture—the fracture itself is of practically no importance whatsoever, there is no dislocation of fragments, owing to the pull of muscles as elsewhere on the skeleton, the cracks, which indeed may often be very difficult to find post mortem, unite promptly if life is spared, and so far as the bony injury is concerned no active measures are needed. Injuries, however, of such a character that they lead to a bursting fracture, with meridional fissures which radiate into the base, almost invariably produce serious symptoms from an accompanying lesion or lesions of the brain

Is there any more or less routine method of intervention which can promptly be utilized to meet the intracranial symptoms which accompany these basal fractures, in the presence of which surgeons usually adopt a waiting policy?

Without entering into the controversy as to what is concussion and how its manifestations and anatomical lesions differ from those of contusion, it may be said that the symptoms of most of these cases are brought about by an increase of intracranial pressure, whether *immediate* from free extravasation due to the laceration of cortical vessels, *intermediate*, often with a "free interval" of consciousness, when an extravasation outside of the dura slowly augments in size, or *late*, often a matter of a few days, when cerebral oedema occurs. In many cases, indeed, the symptoms of these various conditions shade imperceptibly into one another

The phenomena of compression are so well understood that they need not be detailed, the slowed pulse, the rise in blood-pressure, the headache, vomiting, and choked disc are seen in their most typical guise in these cases. Particularly have we found that the condition of the eye-grounds is most helpful in recognizing an advancing process, and the presence

of free extravasation in the subdural spaces as is well known can easily be determined by a lumbar puncture

During the past three years in a fairly large series of cases we have followed the routine of making a subtemporal exploration through a split muscle incision combined with a subtemporal decompression—namely the removal of a circle of the thin bone about  $4\frac{1}{2}$  cm in diameter from under the muscle together with a dural opening. Contrary to our former high mortality in cases of basal fracture—about fifty per cent—we have only lost two out of our last fifteen cases both of these due to the fact that a unilateral exploration alone was performed and an extensive extravasation—extradural in one case subdural in the other—on the opposite side of the head was overlooked

The advantages of the procedure in addition to its simplicity may be summarized as follows (1) The approach is made through the thinnest available part of the skull (2) The opening is made under the temporal muscle the fibres of which are split and not divided so that when closed they serve to prevent too great bulging if the tension tends to make the brain herniate and serve also to prevent a subsequent obtrusive depression when the normal conditions have been restored. A subsequent defect in this situation is absolutely harmless (3) In case there has been a rupture of the meningeal or of one of its branches the extradural clot is certainly brought into view by this opening and as the meningeal trunk is exposed the vessel can be easily ligated (4) In all bursting fractures accompanied by laceration of the brain it is the tips of the temporal and base of the frontal lobes which most frequently suffer and a subdural extravasation from this source can most readily be dealt with through an opening in this situation (5) In a large proportion of bursting fractures the lines of fracture seek out the mid cranial fossa and hence free bleeding from the base can be most easily drained through the temporal fossa by protective drains placed under the temporal lobes (6) The subsequent œdema and swelling of the brain which is an almost invariable sequel of any serious

cerebral contusion and which is responsible in many cases for the pressure symptoms during the first two weeks, can be best combated by an opening in this situation under the muscle (7) Aside from the prompt subsidence of the acute symptoms which are often seen after these operations, they appear to lessen many of the unpleasant late sequels—traumatic neuroses—which are so often a feature of the cases which have recovered without operation

I believe, in view of our experience with this simple operation—which, in so far as the approach to the cranial chamber is concerned, differs from the subtemporal decompressive operation for tumors only in the obliquely vertical (Fig 1) instead of curvilinear direction of the scalp incision—that less risk is run even in the milder or border-line cases by a prompt exploration and decompression, than in waiting for nature to take her own course in absorbing extravasations and œdema in an unopened skull





# OSTEOPLASTIC RESECTION OF THE SKULL

WITH DESCRIPTION OF A MODIFICATION OF STELLWAGEN'S INSTRUMENT  
FOR PERFORMING THIS OPERATION \*

BY ALFRED C WOOD M D

OF PHILADELPHIA

Addressed before the Philadelphia Academy of Surgery February 3 1908.

AMONG the notable advances in surgery in recent years intracranial operations occupy a prominent place. This fact is due largely to the development of the osteoplastic method of exposing the brain and its membranes. Wagner who has the credit of first performing this operation in 1889 employed the chisel and mallet to cut through the skull. The value of this method of exposing the brain was at once recognized by surgeons and almost immediately suggestions of new instruments to replace the chisel and mallet in effecting the bone section began to appear and have continued at frequent intervals up to the present time. Without reviewing the discussion as to the relative merits of the original method and the numerous substitutes that have been recommended which is now an old story it may be confidently stated that the chisel and mallet are employed less frequently each year in the operation now under consideration.

At the present time the rivalry is chiefly between bone cutting instruments and saws driven by power—usually electricity—and certain cutting forceps and instruments manipulated entirely by the hands.

It is not the purpose of this report to open a controversy on the relative merits of these two general methods of procedure. It will be admitted at the outset that each has its well defined field of usefulness as have also a number of the different instruments that have been described. Nothing can be more trite than the statement that an instrument that one surgeon will use with facility and satisfaction will be

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Read before the Philadelphia Academy of Surgery February 3 1908.

considered wholly inappropriate under identical circumstances by another operator I have, therefore, no arguments to advance against any of the methods that have been successful in other hands I desire, merely, to describe an instrument that has been eminently satisfactory to me, and one, I believe, that deserves a trial from those who have not felt satisfied with the methods they have heretofore employed

In 1903 Dr Thomas C Stellwagen, Jr, of this city, devised an instrument for cutting an osteoplastic flap of the scalp and skull Shortly thereafter I had the opportunity of assisting Professor J William White in some cases of osteoplastic resection of the skull in which he used this instrument, and subsequently employed it in two or three cases in my own service I was surprised at the ease with which the bone flap was cut, and although the instrument accomplished the object for which it was intended it seemed to me susceptible of improvement in certain minor features The first objection encountered in this limited experience was the severe tax on the pronator and supinator muscles of the forearm, which, being unaccustomed to prolonged efforts of this kind, became very tired, so that it was necessary to rest from time to time The second objection from my standpoint, was the lack of security of the plate upon which the shaft of the instrument revolved In spite of every effort I could make it would soon become loose\* and had to be held by the fingers of the left hand, or by an assistant, whose hand in the vicinity of the wound, was usually more or less in the way and impeded the progress of the operation A third objection was the free hemorrhage from the vessels of the scalp while the bone was being cut through While hemorrhage from a scalp incision is always copious, and requires the application of a large number of hæmostatic forceps, the sweep of this instrument made the use of the forceps impossible and the well-

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\*Dr Stellwagen informs me that he has since adopted the use of wood screws which overcome this difficulty However, I prefer the modification here described as this instrument has a fewer number of parts and less time is consumed in establishing the central point or base

known difficulty of tying the scalp vessels results in a great loss of time. This last objection was overcome to some extent theoretically by some operators by cutting a short segment of the flap at a time and sawing through the subjacent bone then enlarging the scalp incision and the bone section part by part until the necessary flap was formed. My own observation leads me to say that the total amount of bleeding which occurred when this method was employed was just as great as when the whole flap was cut at once and in addition the time required to change from the knife to the saw and back again and the extra time required in forming the flap prolong the operation unnecessarily.

To overcome the first difficulty mentioned it occurred to me that by attaching a handle to the end of the arm carrying the saw the force required in cutting the bone could be applied more comfortably that is in a way that would be much less tiresome to the operator. This addition to the instrument required the shaft to turn freely upon the handle instead of being fixed as in the original model. Further as both hands were required to operate the instrument an effort was made to do away with the base plate which had been a source of inconvenience as already stated.

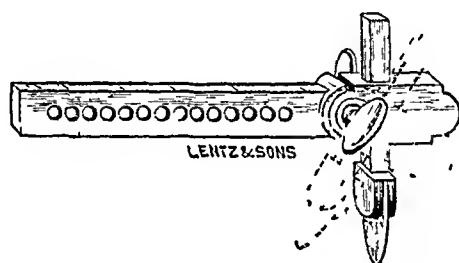
In my first model all of the features of the Stellwagen instrument were retained. To these were added the handle at the end of the arm the rotating shaft armed with a spear pointed pin at the end opposite the handle which bored a hole in the skull as the shaft rotated and thus became fixed. A shoulder at the junction of the shaft with the pin prevented the latter from penetrating too deeply and injuring the membranes of the brain. Motion was provided at the joint between the arm and the shaft otherwise it would be necessary to incline the shaft at various angles as the saw swept over the irregular surface of the skull and as it penetrated the bone. In order to combine both ideas in one instrument it was necessary to have means first to fix the shaft rigidly to handle and second to fix the arm firmly to the shaft—when used



in the original way To meet the requirements in the other case, both of these points must be freely movable

Subsequently, the idea of retaining all of the original features was abandoned, as the instrument was thus unnecessarily complicated and further experience with the modified form led me to feel that in the latter, all of the requirements were fully met An effort was made at first to cut the skull obliquely rather than perpendicularly, in order that, when the operation was completed and the skull flap returned, it would be supported by the bevelled edge of the section and would thus be prevented from becoming displaced inward With this object in view, in the first model, the clamp at the outer end of the arm in which the saw was secured was arranged so that the latter could be adjusted at any angle

FIG 1



desired (see Fig 1) After a little experience this feature was omitted, as the perpendicular section is, I believe, in every way satisfactory The theoretical preference for the formation of a support for the bone flap must be admitted, but I have never observed any tendency of the fragment of bone to become displaced inward, nor do I recall having heard of such a complication

The drill-pointed pin at the end of the shaft which did not give satisfaction was substituted by a blunt pin, and a separate drill was provided

The various parts of the instrument are shown in Fig 2, and are as follows

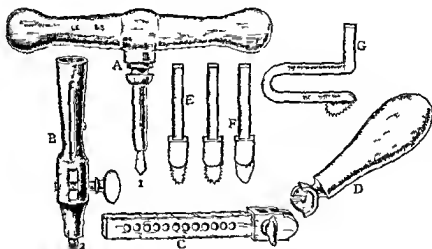
- 1 A T-handle (A), armed with a bone drill (1)
- 2 A shaft (B), to which the handle is adjusted, provided

with a fenestra to accommodate the radial arm and a blunt centre pin at the end (2) The handle is held to the shaft by a spring but is instantly released by slight traction

3 A radial arm (C) which is received in the fenestra in the shaft and is secured by a thumb screw The knife and saw are carried at the outer end of this arm and are held by a set screw

4 A radial arm handle (D) to be adjusted to the extremity of the arm and used to give the circular motion to the knife and saw The arm is graduated in inches and centi-

FIG



metres so that it may be instantly adjusted to cut an opening of the desired size

### 5 Knife and saws (F F G)

The saw (G) is designed to cut the base of the bone flap by carefully raising the pericranium and scalp along the proposed saw line The sawing must be done very deliberately in order not to detach the scalp from the body of the bone flap

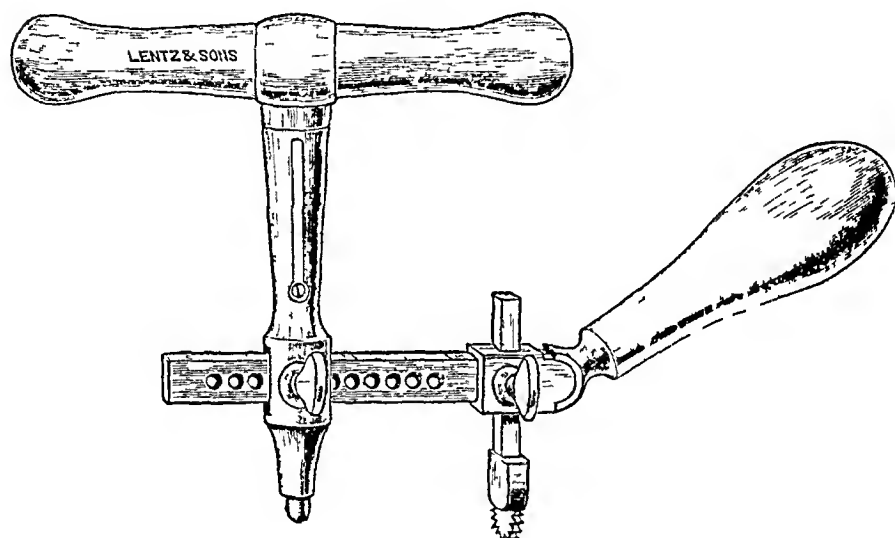
Fig 3 shows the instrument assembled ready for use.

The operation with this instrument is carried out as follows

The head is prepared in the usual way The fissure of Rolando the fissure of Sylvius or any intracranial landmark

desired as a guide at the operation should be marked upon the scalp. After the patient is anæsthetized, important points may be scratched with the point of a scalpel and the entire scalp may again be cleansed with alcohol and bichloride solution. The size of the circle required to expose the area of brain which it is desired to inspect, is determined and the central point marked by scratching an "X" on the scalp with the point of a knife. The radial arm should now be adjusted by the scale to cut a circle of the desired size. When all is ready, a half-inch incision is made in the scalp at the central

FIG 3



point (X), the handle, carrying the drill, is then removed from the shaft by slight traction, and a hole bored in the skull at the centre of this incision. The drill is prevented from going through and injuring the membranes by a shoulder. The handle is then replaced in the shaft and the knife inserted in the outer end of the arm where it is secured by the set screw. The T-handle is held in the left hand, the arm handle is applied to the end of the arm and held in the right hand, while the pin at the end of the shaft is introduced into the hole bored in the skull. The scalp flap is now cut, down to the bone, usually by a single sweep of the knife, which should

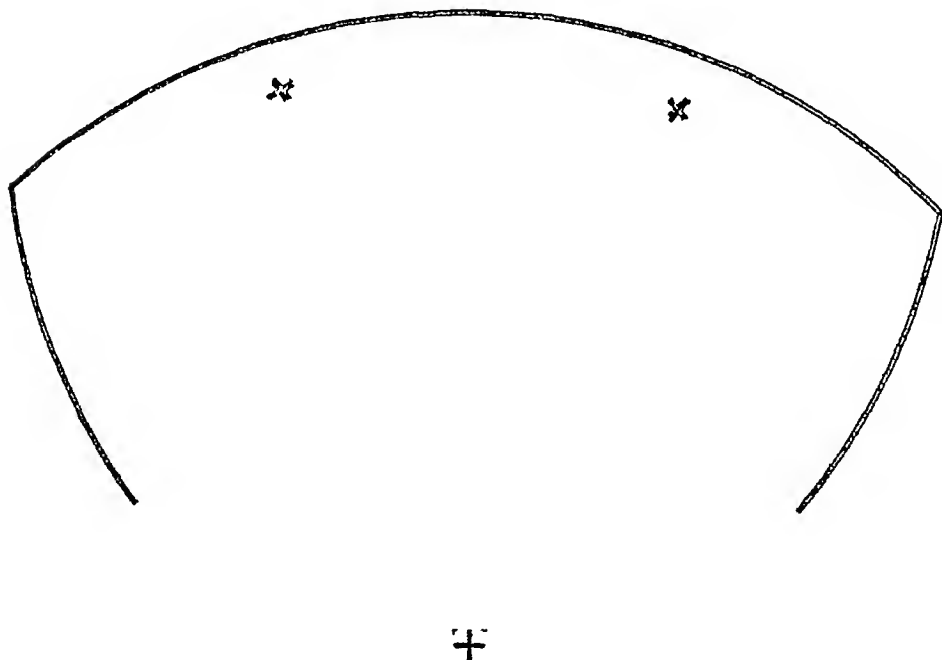
be introduced at the point at which it is desired to begin the incision and carried around to the point at which it should end forming two-thirds or three fourths of a circle. During this manœuvre as the scalp is freely movable on the skull an assistant should steady the former and make traction against the pull of the knife so that the flap shall not be distorted. The knife is then replaced by the saw and the bone cut by moving the saw forward and backward by means of the handle held in the right hand. The saw may be made to traverse the entire length of the incision in either direction with one sweep but it will usually be found more convenient to cover about one half of this distance. The saw is so constructed that it cuts equally well in either direction it is guarded by a shoulder the blade is scant  $3/16$  inch long so that it may be used freely without danger of wounding the dura. If the skull is unusually thick at any point the saw may fail to cut entirely through but no difficulty will be found in prying up the bone flap if two narrow chisels be employed. If the bone has not been cut entirely through at any point a little edge will be left which may be cut away with rongeur forceps or may be allowed to remain to support the flap when it is returned. This support may always be obtained if desired by leaving one or more points where the inner table is not entirely sawed through. After the bone section is complete the base may be sawed through (under the dura) or the bone may be pried up by two chisels thus breaking the base of the bone flap. No special comment is needed as to the incision in the dura which is made according to the usual rules.

Two points in connection with the use of the instrument require special mention. First in placing the radial arm in the shaft be particular to see that the proper face is uppermost otherwise the arm handle cannot be adjusted. Second when sawing the bone the shaft should be kept perpendicular to the skull for if inclined the saw will be carried in the same direction. After a groove has been cut in the skull if the saw does not tend to follow this track it will be because the

position of the handle has changed. A very little manipulation will again bring the saw in its proper position.

If a larger exposure of the brain is desired than is afforded by the circular flap, a somewhat rectangular flap may be made by cutting the segments of three circles of the required size. Fig 4 illustrates this idea. The "X's" indicate the three centre points used to form this flap. Many variations in size and shape are possible.

FIG 4



I have employed this instrument in a number of cases with very great satisfaction. Its use does not tire the muscles at all, it is easily manipulated by any one, it is absolutely safe, and it cuts rapidly. The whole time required to expose the brain has not been observed, but in a number of instances the time has been taken from the moment I began to saw the bone until the flap of scalp and bone was turned up and the dura exposed. The longest period required was eight minutes, and the shortest, one minute and fifty seconds. The latter was in a man about 35 years of age, the flap being three and

one half inches in diameter With a little practice this part of the operation should be done easily in from three to four minutes the hole for the centre pin may be made in from one half to one minute and the scalp should be cut in a minute. Thus in the absence of complications the whole operation of opening the skull need not consume more than from five to six minutes The very short time consumed in the operation results in a marked decrease in the amount of blood lost and as soon as the flap is raised forceps may be applied or other measures adopted to prevent further hemorrhage from the scalp wound

Among those for whom I have operated and who have witnessed the use of this instrument are Drs Charles K. Mills William G Spiller M Howard Fussell Charles S Potts T H Weisenberg J H W Rhein and S Ross Crothers

I believe the following claims may be made for this instrument

1 It enables one to cut an osteoplastic flap of the skull quickly and safely

2 No injury can possibly be done The careless or clumsy use of the instrument can do no harm

3 Every part may be sterilized by boiling

4 It is always ready for use as there are no complicated parts to get out of order

5 It is complete in itself and does not depend upon electric currents motors assistants or anything but the hands of the operator

# ATLO-OCCIPITAL DISLOCATION

A CASE OF FRACTURE OF THE ATLAS AND AXIS, AND FORWARD DISLOCATION OF THE OCCIPUT ON THE SPINAL COLUMN, LIFE BEING MAINTAINED FOR THIRTY-FOUR HOURS AND FORTY MINUTES BY ARTIFICIAL RESPIRATION, DURING WHICH A LAMINECTOMY WAS PERFORMED UPON THE THIRD CERVICAL VERTEBRA

BY N J BLACKWOOD, M D,

Surgeon, U S Navy

AT 1 05 P M , Sept 18, 1907, the patient G F G , Ordinary Seaman, U S N , aged 19 years and 3 months, was doing some gymnastic exercises on the gun deck of the U S S New Jersey, and while attempting the trick known as "cutting off," his hands slipped, and he fell to the deck, a distance of about four feet, landing on the right side of his head, the weight of his body being above and his head and neck bent underneath. He was immediately picked up by his companions and carried down to the sick bay, as he was unable to walk and apparently unconscious. He was at once seen by the medical officer on duty, who finding him cyanotic and gasping for breath immediately started artificial respiration. Upon examination the following condition was discovered:

Complete paralysis both motor and sensory, from the line of the larynx down. Muscles were flaccid, with no rigidity anywhere, and no constrained position assumed by any of the extremities. All reflexes were lost and remained so while life lasted, with the single exception of the plantar reflex which returned very slightly about five hours after the accident. Priapism was present within the first half hour and remained constant until death supervened. There was an involuntary evacuation of the bowels within the first fifteen minutes, but no passage of urine, which had to be withdrawn with a catheter.

Patient was perfectly conscious during the whole period of life, hearing and understanding everything that was said to him, replying either by winking the eyes, noddings and shakings of the head, or when air was being forced through the larynx, by a few spoken words. At all times he could move his lips

and tongue forming words but no articulate sound could be made except when aided by very forcible pressure on the chest walls. The paralysis of respiration was complete and as far as could be discovered there was no organ below the larynx that was performing its normal functions with the single exception of the heart. In attempting to breathe there would be frequent tracheal tugs and the tongue would be protruded and the face screwed up whenever the patient tried to swallow. There was no sense of thirst or hunger and after a little water had been given the patient by means of a medicine dropper he refused to take anything which had to be swallowed. Contrary to the expectation and as naturally follows in breathing through the mouth there was no dryness of the tongue and fauces but they appeared to be always moist. When first seen and when the efforts of the patient to breathe were most pronounced there appeared to be a narrowing of the fauces caused by a protrusion of the posterior wall. The eyes were at first closed and on opening them there was an external strabismus and the pupils were reduced to pin points both of which conditions improved until the eyes became almost normal responding to light and at all times were symmetrical.

At first the heart was almost inaudible and very slow and the patient was pulseless but under the influence of artificial respiration and cardiac stimulants the strength increased and the beats reached 72 being full and strong but irregular and intermittent sometimes dropping two or three and at other times giving an abortive beat.

Patient at no time seemed to suffer from pain but on being questioned said my head hurts. The body surface temperature was good at first but later fell and had to be maintained by the application of hot water bottles. There did not seem to be any area of hyperæsthesia or any marked degree of sweating in any part until on the second day the body sweat so that it was thought that there had been an evacuation of urine. A careful examination of the spinal column in the cervical region revealed no dislocation as far as the spinous processes were concerned but there seemed to be an unusual depression between the atlas and the base of the occiput. Believing that this might be a dislocation an attempt was made by extension and counter extension with manipulation of the cervical vertebra to effect a reduction but



with no permanent results or improvement in the general condition

As all the symptoms pointed to an injury at or above the third cervical vertebra, as nothing so far had effected any relief of the symptoms, and as the patient was only kept alive by means of artificial respiration, which could not be continued indefinitely, it was decided, in the hope that perhaps there was not a complete transverse lesion of the cord, to do a laminectomy on the third cervical vertebra, and to relieve any pressure which might exist either as the result of hemorrhage, fracture, dislocation or spicule of bone which had penetrated the spinal cord. The question then arose as to how to operate on the back of a patient's neck, who must be on his back in order to receive artificial respiration. It was suggested that he might be put on his side and unilateral respiratory movements be made or on his back and pressure exerted on his back. He was accordingly turned on his side, and artificial respiration applied with one arm, which seemed to supply a certain amount of air, but the patient's color soon showed that he was not getting sufficient. He was then turned on his face, his forehead and chin being supported by hard pillows. What was our surprise to hear him gasp, and the artificial respiratory movements being stopped, the patient began to breathe, the diaphragm performing the work alone. In this position and in this way the patient continued to breathe for seven minutes, when he gradually became cyanotic and ceased breathing, and he was immediately put on his back and artificial respiration recommenced.

It was therefore decided that the operation must be done with the patient on his back, if it was to be done at all. The field of operation was then prepared in the usual way and an aseptic towel placed about the head to act as a sling. The patient was placed on the table with the head and neck extending beyond the end and supported by a nurse holding the sling. One nurse was on each side of the table, each having an arm and doing the usual motions for artificial respiration. The operator on a low stool had to work much as a fresco painter does when painting a ceiling. It was found that by slightly elevating the head, the field of operation was better exposed, but also the bending of the neck cut off the passage of air to the lungs to a certain extent, and every few minutes the head had to be lowered to the horizon-

tal position and artificial respiration applied more vigorously. With these frequent interruptions the operation required much more time than it would ordinarily do as can well be imagined. Of course no anæsthetic could be given by inhalation and as all sensation was lost from the middle of the neck down it was only necessary to inject some cocaine solution to destroy the sensation in the small part of the field of operation that was still supplied with active nerve influences. The patient was perfectly conscious during the whole operation and felt absolutely no pain. The operation was begun about 11 30 P M and completed at 1 50 A M. It is not necessary to describe the various steps of the operation as they are well known to all. The spinous processes and laminae being exposed no fracture could be felt but there seemed to be increased lateral motion of the atlas and the dislocation of the occiput forward on the spinal column was very evident but all attempts to reduce it and have it remain in position failed. The spinous process and laminae of the third cervical vertebra were removed and the membranes of the cord exposed. Aside from the fact that there was a slight congestion these appeared to be perfectly normal and were not disturbed. Patient stood the operation well and except for a little extra stimulation on account of the heart action he required no special treatment and showed no ill effects. But no good results were noticed. He continued in the same condition until about 10 A M of the 19th when he vomited a bile stained fluid. 800 c c of urine were drawn off and at 11 A M he vomited again. About noon there appeared some blood stained moisture on the sheet under the patient and it was feared there might be some recurrent hemorrhage from the wound. This was examined and found in perfect condition clean dry and healthy and it was then discovered that the moisture on the sheet was caused by most profuse sweating of the patient's body.

During the afternoon patient had several sinking attacks when he became pulseless and could only be revived by heroic efforts. He remained conscious up to the last except during these syncopal attacks but the heart grew gradually weaker responding less and less to stimulation and he finally died at 11.45 P M September 19th.

A postmortem was held at 10 A M Sept 20th ten and a quarter hour after death and the following condition found

The occiput was dislocated forward on the spinal column, and the cord nipped between the posterior edge of the foramen magnum and the posterior surface of the odontoid process of the axis. The atlas was fractured in three places, twice laterally just at the point of attachment of the transverse or check ligament, and once posteriorly. The odontoid process was broken off short on a line with the superior articular surface of the axis. The membranes of the cord were intact, but the cord itself was reduced to a pulpy mass from the level of the foramen magnum to the interval between the axis and the third cervical vertebra.

From the disclosures at the postmortem we are convinced that nothing could have been done to save the patient's life, and the wonder is that he should have lived so long. Had it not been for the prompt action of Assistant Surgeon M. H. Ames, U. S. N., in starting artificial respiration and the untiring efforts of the corps of nurses and assistants in administering the same, this would have been one of the cases of practically instantaneous death that are so common with a broken neck.

Medical literature is full of reports of cases of fracture, dislocations of the vertebra, and discussions of the symptoms, treatment and prognosis of spinal injuries, but in a most careful search, we have been able to find but one reported case similar to our own, as to location and character of fracture, when artificial respiration was carried on for three and a half hours, and no case under similar conditions where an operation was performed or life prolonged for so many hours. We are therefore led to believe that the case is unique, and report it as such. There are many observations which it would have been most interesting to make, but which were rendered practically impossible by the conditions, and the small chance of taking observations for fear of interfering with the artificial respiration.

# FRACTURE THROUGH THE ANATOMICAL NECK OF THE HUMERUS WITH DISLOCATION OF THE HEAD

BY JOHN J BUCHANAN M D

OF PITTSBURG PA

S geo t M cy d C l mb Hospit l P f f S g y  
d Cl cal S g ry W t m P yl l M d l C ll g

FRACTURES through the anatomical neck of the humerus associated with dislocation of the head present features so distinctive in the mechanism of their production in their pathology in their amenability to external treatment and in the nature of their operative treatment as to place them in a class by themselves

Fifty years before the Christian era Pasticrates treated of fracture dislocation at the shoulder joint but no case of fracture of the anatomical neck with dislocation is recorded prior to 183 when Delpech reported the case observed by Houzelot in 1808 It has thus been exactly a century since this injury has been recognized as a distinct entity and even to the present time it has been treated in literature only in connection with other fracture-dislocations at the shoulder This is not to be wondered at when it is considered that so far only 34 undoubted cases have been recorded If to these are added 9 unverified cases the number still is small for a definite lesion whose history extends over a hundred years

The present paper is concerned with the report of a typical case under the author's care with a resume of the other cases on record and a consideration of the mechanism of the injury and the methods of treatment

**AUTHOR'S CASE**—On June 14 1907 Mrs O 58 years of age tripped on a plank while walking on sloping ground and pitched forward falling full length She is unable to say just how her arm and shoulder met the ground but she was certain at the time that very great violence had been sustained Her physician Dr Hamilton was summoned and made a diagnosis of

dislocation of the shoulder. He at once placed her under the influence of chloroform and made efforts at reduction. After several trials these efforts appeared to be successful and the arm was bandaged to the chest wall. Pain of the most persistent and severe character, extending down the arm, continued for the next sixteen days, at the expiration of which time the author saw the patient in consultation.

The ordinary signs of dislocation were not present. The rotundity of the shoulder was almost completely preserved. The elbow could be applied to the chest wall and the hand placed on the opposite shoulder. The tuberosities could be felt to rotate under the acromion when the shaft of the humerus was turned on its axis. No crepitus could be elicited. Although the usual signs of dislocation and fracture were absent, the persistent pain and helplessness of the limb indicated a serious injury and rendered an X-ray examination advisable.

The next day the plate represented by Fig. 1 was made by Dr. R. H. Boggs of this city, and it became at once evident that there existed a fracture of the anatomical neck with subglenoid or axillary dislocation of the head.

*Operation*—On July 4th (20 days after injury), at Columbia Hospital, the patient was anesthetized and an incision made along the lower border of the anterior axillary fold. This was deepened till the axillary vessels and nerves were reached. These were found to stretch tightly over the underlying dislocated head, which was firmly embedded in the soft tissues. To a portion of the circumference of the neck was still attached the capsular ligament, and so firmly was the head held under the vessels that efforts to displace it were without avail and it seemed that it would be impossible to dislodge it, without injury to the overlying vessels. By cutting the shreds of capsule from its periphery and by patient manipulation of the vessels, and strong traction with lion-jawed forceps, the head (Fig. 2) was finally extracted. The wound healed without reaction and the patient returned to her home in two weeks.

She was examined on December 31st (about six months after injury) and the following condition found. Arm of normal appearance. Very little wasting. Arm hangs naturally to side. Unaided abduction of arm possible only to extent of about 45 degrees. By passive movements, the arm can easily be brought



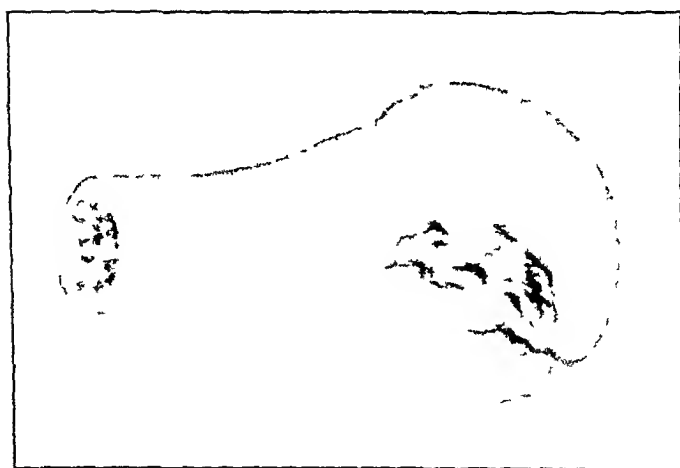
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FIG 2



Fractured and dislocated head of humerus after removal by operation

FIG 3



Dislocation of humerus with indentation of the anatomical neck. (Card )

almost to horizontal All the movements of forearm normal and swinging movements of limb satisfactory Use of arm much improved in last three months Patient has much neuralgic pain extending along the course of the median nerve This is no doubt due to a neuritis from pressure of the head prior to removal

#### CASES RECORDED IN THE LITERATURE.\*

The cases of this injury so far reported may be separated into three groups (1) Clinical cases verified by operation or autopsy (2) Clinical cases not so verified but depending for their diagnosis on the opinion of the attending surgeons (3) Specimens without clinical history

#### I CLINICAL CASES VERIFIED BY OPERATION OR AUTOPSY

(29 in all)

##### *A—Cases not Subjected to Operation*

(1 in number)

1 HOUZELOT (1808) (reported by Delpech)—Injury is the result of a fall from a stroke of apoplexy Posterior dislocation of head

The following cognate injuries are not included in the present account but the histories of all such cases have been examined to assure the completeness of the regular list

- 1 Pertubercula fractures with dislocation
- 2 Fractures of the neck with dislocation in which no definite statement is made by the reporter as to line of fracture
- 3 Fracture of surgical neck with dislocation
- 4 Incomplete or impacted fractures of anatomical neck with dislocation (4 cases—Ange Bennett, Maxwell Heilberg)
- 5 Fractures of neck produced by futile efforts at reduction of dislocation.

6 Cases in which union had occurred: a fracture dislocation of the anatomical neck and subsequent operation was done (two cases)

*Tanaka* (La Riforma Med Napoli 1897 xi Pt. 173) in a man of 44 years existed 8 cm of the upper end of the luxated humerus which showed an united fracture of the anatomical neck

*Royce* (Journal Amer Med Assoc. 1907 xiv 487) in a boy of 6 years replaced by open incision a subcoracoid luxation of a humerus in which close inspection revealed line of callus formation, and deformity indicating a healed fracture through the anatomical neck of the humerus The outcome of the case was most gratifying

Perhaps the six cases in groups 4 and 6 belong more properly in the regular list but a careful study of the original reports has induced the author to place them in classes by themselves



Patient died in twelve days Autopsy *Thamhayn Inaug Dissert Ueber die mit Fractur des Collum Humeri complicirten Schulter Luxationen*, No 26

2 TRAVERS (1823)—Fall Head dislocated into axilla Both tuberosities separated from shaft and drawn in opposite directions Death months later Autopsy *London Med Repository*, 1823, xx, 222 *Gurlt Handbuch der Lehe, von den Knochenbrüchen*, Obs 97, p 696

3 LALLEMAND (1827)—Fall of 12 or 15 feet Head dislocated under clavicle Additional fracture of greater tuberosity Efforts at reduction futile Death from Erysipelas in 38 days Autopsy *Oger (A) Etude sur Les lésions scapulo-humérales compliquées de fracture de la partie supérieure de l'humérus* Paris, 1884 No 52

4 HEALE (1835)—Man of 60 years Efforts to reduce on the second day failed Death 15 months later Autopsy *Thamhayn, loc cit* No 25

5 COOPER (1824)—Fall from a horse Failure of efforts to reduce Autopsy many years later *Guy's Hosp Rep* 1839, iv, 273

6 KEY (1839)—Man of 63 Tripped at head of stairs and fell with outstretched arm and rolled to bottom, striking his shoulder violently on the way Death in three months Autopsy showed fracture of anatomical neck, also united fractures of six pieces "close to the neck," with subglenoid luxation of the head *Guy's Hosp Rep* 1840, v 92

7 MALGAIGNE (1840)—Patient seen about six weeks after injury Cause of injury unknown Died with suppuration two months after injury Autopsy showed fracture of both anatomical and surgical neck with dislocation of head *Malgaigne Traité des fractures et des luxations*, Paris, 1855, p 547

8 MANZINI (1840)—Man of 57 years Fracture of both anatomical neck and surgical neck and forward dislocation of head Efforts at reduction unsuccessful Death two months later, suppuration Autopsy *Thamhayn, loc cit* No 31

9 LENOIR (1851)—Fat woman of 83 years Fell from heat of sun with outstretched arm Fracture of both anatomical and surgical neck No effort made to reduce head of bone Died of apoplexy, after consolidation *Oger, loc cit* No 53

10 SURGEON TO MANCHESTER ROYAL INFIRMARY (1852)—Man of 58 years Fell from a height and "pitched on his shoulder" Fracture of anatomical neck and one just below the surgical neck, with luxation of the head into the pectoral muscle Death on the sixth day from gastric hemorrhage from ulcer Autopsy *Provincial Med and Surg Jour*, 1852, 267

11 ST THOMAS' HOSPITAL MUSEUM (reported 1861)—History of a fall from a horse many years before *Trans Path Soc London*, 1861, vii, 188 *Gurlt loc cit* Obs 116, p 705

12 MABBOUT (1877)—Adult male Fall from horse Luxation of head into axilla Death in thirty days Autopsy *Poncet et Manclaire Revue de Chirurgie*, Oct 1892 vi, p 849

*B—Cases in Which the Head Was Excised*

(14 in number)

1 MORTON (1884)—Man of 73 Fall down stairs Head freely movable in axilla Vigorous efforts at reduction unsuccessful Head excised Patient ready for dismissal in 13 days when he had an attack of diarrhoea from which he died one week later *Am J Med Sci* 1884 lxxxvii 173

2 POIRIER (1889)—Man of 37 Fall with land carried forward Shoulder did not touch the ground Head luxated into the axilla Efforts at reduction without avail Head removed by incision Very good use of the arm resulted Arm could be brought to horizontal other movements satisfactory *Poirier et Maucclairc loc cit Obs v p 849*

3 CROFT (1889)—Patient 33 years old Fall through a trap door eighteen feet Subclenoid dislocation of head Ineffectual efforts to reduce under chloroform Head removed by incision three days after injury Moderately good result *Lancet* 1890 i 701

4 CLUTTON (1892)—Woman 61 years old Luxation of head into axilla Head removed eight days after injury by incision Head lifted out without the use of a knife or scissors Excellent result *Southern Transact Amer Surg Assoc* 1897 xv 330

5 POIRIER ET MAUCLAIR (1892)—Man of 63 Fell on his shoulder on the partition of a coffin Efforts at reduction failed Incision and removal of head twenty four days later *Poirier et Maucclairc loc cit Obs vi*

6 McCRAW (1897)—Man of 45 Head luxated into axilla Operation four weeks later Three inch incision made through deltoid through which it was impossible to reach the head Axillary incision then made and removal of head with difficulty it being firmly held between capsule and bone Excellent result *Southern loc cit* 331

7 GERSTER (1897)—Man of 47 Fall from car on outstretched arm Open incision and removal of head one month after injury Vessels and nerves stretched over head Death from infection *ANNALS OF SURGERY* 1897 xxvii 660

8 SALMON (1899)—Fall down stairs Head luxated into axilla Head excised 11 weeks after injury *Medical Circulars* 1900 v 134

9 CURTIS (1899)—Man of 29 Fell in a fit and struck his shoulder Subclenoid luxation Operation 11 days after injury Incision along margin of deltoid Head easily removed Good result *ANNALS OF SURGERY* 1900 xxxi 295

10 BRICHAM (1899)—Man of 34 Thrown from a buggy in a fit and away falling on the palm of his hand Five months later head was removed through incision along border of pectoralis major Head had united to shaft Good result *ANNALS OF SURGERY* 1900 x 614

11 JEFFSON (1899)—Man of 48 Knocked while carrying a tracoracoid dislocation of head Removal of head Good result *Western Med Rev* 1900 v 297

12 DOLLINGER (1902)—Excision of head probably done Particulars scanty *Centralbl f Chir* 1902, xxix, 1277

13 KEEN (1905)—Man of 60 Fall on the shoulder Subcoracoid luxation with reversal of head Head removed 5½ weeks later Very adherent Care necessary to avoid injury to vessels and nerves Good result *ANNALS OF SURGERY*, 1907, xlv, 945

14 BUCHANAN (1907)—Case above reported

*C—Cases in Which the Head was Returned to the Glenoid Cavity*  
(3 in number)

1 WOLFLER (1890)—Male adult Recent dislocation Head free in the axilla Axillary incision Reduction of head and pegging of fragments Primary union Remote result, fair *Souchon, loc cit* p 328

2 McBURNEY (1895)—Man of 28 Fell from a chair in a "fit" Subcoracoid luxation Operation by deltoid incision, 25 days later Head replaced in glenoid cavity with McBurney's hook and vigorous external finger pressure Good use of arm resulted *ANNALS OF SURGERY*, 1896, viii, 501

3 CURTIS (1899)—Girl of 11 Fall on shoulder and head Head luxated into axilla Operation the day after injury after futile attempts at reduction Anterior incision at border of deltoid failed to expose the head Koehler's posterior incision, with temporary resection of acromion was then made By strong pressure of the fingers, through both wounds and in the axilla, the head was, with difficulty, forced into the glenoid cavity A tendency of the shaft to ride upward was counteracted by the passage of a drill into the head, grazing the upper end of the lower fragment Primary union Good result Abduction to 60° at time of report *ANNALS OF SURGERY*, 1900, xxxi, 301

II—CLINICAL CASES NOT VERIFIED BY X-RAY, OPERATION OR AUTOPSY  
(9 in all)

1 v LANGENBECK (1855)—Man of 22 Kicked by a horse Subcoracoid luxation of the head Efforts at reduction unsuccessful on two occasions Good final result Arm could be brought to horizontal *Gurlt loc cit Obs*, 175, p 736

2 DUNN, SMITH & ERICHSEN (1862)—Young man Epileptic Had a convulsion, and was saved from falling by his brother It was the opinion that "the anatomical neck was broken across" Mr Smith "forcibly seized the end of the depressed bone with both his hands, and lifting it up in the direction of the socket, found to his great satisfaction and surprise that the head of the bone slipped readily into the glenoid cavity" The result was a perfect cure The context, however, would lead to the belief that this was simply a *dislocation without a fracture* *British Med Jour*, 1862, 1, 140

3 DERMARQUAY (1866)—Woman of 38 Struck by a carriage on shoulder and fell on elbow Subcoracoid luxation Impossible to reduce under chloroform *Oger, loc cit*, No 40

4 FRASER (1807)—Boy of 15 Caught by a crank of a balance wheel Multiple injuries Among them a downward dislocation of the humerus and upon rotating it after reduction crepitation was very perceptible at the joint showing a fracture at the anatomical neck. Final result The shoulder joint to all appearances as natural as before the accident. *Amer Jour Med Sci* 1860 lvi 372

5 GOSSELIN (1869)—Case used by a fall Head of bone luxated into axilla. Failure to reduce after union. *Oger loc cit* p 55

6 v MOSENGIL (1874)—Railroad employe Head replaced by manipulation Good result. *Arch f klin Chir* xvi 54

7 BOUILLY (1884)—Man of 48 Fell from a tree Both bones of forearm also broken Reduced easily on the 8th day without chloroform by continuous extension with apparatus of Hennequin Home in a month Final result as to function unknown. *Oger loc cit* No 16.

8 BERTINI (1885)—Intracoracoid luxation Easy reduction by pressure. *Po tier et Maclaure loc cit Obs* 9

9 PREWITT (1901)—Man of 27 Fell from a wagon run away Head easily replaced under chloroform. *Inte state Med Jour* 1901 v 1 61

### III—SPECIMENS WITHOUT CLINICAL HISTORY

(6 in all)

1 COOPER (1844)—Specimen clearly delimited on a plate Head had formed a false joint on the scapula It was united by a little tongue of bone to the body of the humerus Humerus had formed a false joint at the glenoid cavity. *Guys Hosp Rep* 1839 i 775

2 HUGUIER (1852)—The head of the humerus had been separated from the bone and placed between the subscapula and serratus magnus It adhered to the bone and was found bare in the hollow of the axilla As there was no ankylosis it is probable that the patient had use of her arm. *Oger loc cit Obs* 4.

3 DUPUYTREN'S MUSEUM—Specimen No 29 Intracoracoid luxation. *Oger loc cit* p 27

4 ST BARTHOLOMEW'S HOSPITAL MUSEUM—Specimen No 103 Subcoracoid dislocation Fibrocartilaginous union. *Gilt loc cit Obs* 114, p 704

5 MUSEUM COLLEGE OF SURGEONS OF IRELAND.—Subglenoid dislocation. *Bennett n Brit Med Jour* 1881 i 638.

6 LEO (1903)—Dissecting room specimen Aged woman. Fracture of both anatomical and surgical neck Subcoracoid luxation with nearthrosis Free motion at shoulder on cadaver. *Brit et Mem Soc Anatom de Par* 1903 6th Ser v 248.

### MECHANISM OF THE INJURY

The manner in which this peculiar injury is produced has engaged the attention of surgeons since the report of Houzelot's case by Delpech in 1808

Delpech (quoted by Poirier and Mauclaire, *l c*) believed that the fracture of the anatomical neck occurs first, then enucleation of the head through the capsule by direct force

Lallemand (1827) was of the opinion that the luxation occurs first, then the fracture *by muscular contraction against the coracoid process or the ribs*

Sir Astley Cooper (1839) expressed himself thus "This accident generally occurs in the following way A person falls and pitches with violence on his shoulder, or a heavily laden carriage passes over it By the first impression of the accident, the *os humeri* is dislocated, and, by a second, the neck of the bone is broken, and the head detached and lodged in the axilla" (Bennett has called attention to the fact that in none of the recorded cases was the injury produced by the passage of a carriage-wheel over the shoulder)

Malgaigne (1855) said "It is very difficult to define exactly the mechanism by which the two lesions, dislocation and fracture, are produced, to determine whether the two lesions are simultaneous, or which precedes the other, whether they are due to direct or indirect injury" However, in his chapter on subluxations of the humerus (in which he was a believer), he called attention to certain specimens of old unreduced dislocations which exhibited a groove or gutter, either on the upper aspect of the head itself or at the upper part of the anatomical neck, and he asked the question "whether sometimes these (grooves) are not produced at the same time as the luxation *by crushing of the head against the glenoid border*"

Mr Joseph Bell (Edinburgh Med Journal, 1863) refers to a case of pertubercular fracture, with dislocation, in which the head and lesser tuberosity were separated from the rest of the bone, and he asks "How is this fissure produced? Not by any peculiarity in the direct violence which caused the injury, not by any conceivable action of the muscles, but *by the sharp edge of the glenoid border being forced as a wedge against the posterior groove of the humerus*"

Spence (1863), whose case was doubtful as to the line of

fracture said As it is scarcely conceivable that both injuries could have occurred at the same time it is probable that she dislocated her shoulder by the fall and subsequently fractured her humerus while rolling down the stair

Bennett (1880) expressed the following opinion Fracture of the upper extremity of the humerus occurring as a complication of dislocation commences at that part of the anatomical neck which rests after dislocation has taken place against the border of the glenoid cavity It is caused by *pressure of the humerus against the sharp edge of the glenoid cavity* probably resulting from a constrained position preventing the separation of the elbow from the side as in ordinary dislocations

The suggestion by Malgaigne that the indentations on the head or on the anatomical neck of his specimens of old unreduced dislocations might have been produced by the primary violence forcing together the sharp edge of the glenoid and the head or neck of the humerus and the unqualified opinion of Mr Joseph Bell that his pertubercular fracture dislocation was produced in this way received an interesting confirmation by some later specimens of recent dislocations

Mr Eve (Med Chir Trans 1886 LVIII 317 quoted by Caird in Edinburgh Med Jour 1887 LVII Pt 2 711) reported the case of a man of 36 years who was knocked down by a train and sustained a subcoracoid dislocation in addition to other injuries from which he died in 12 hours Reduction was easily effected before death At the autopsy there was found a deep vertical indentation or groove at the posterior margin of the articular surface of the head of the humerus into which the anterior margin of the glenoid cavity accurately fits It appears to have been produced by the violent impact of the head against the prominent rim on which it probably lodged

Dr Francis M Caird (*loc cit* p 710) describes two recent specimens without history which are in the Museum of the University of Edinburgh Both exhibit almost precisely the same kind of indentation along the anatomical neck

as is described by Eve. Dr Caird's illustration of one of his specimens is reproduced in Fig 3

Broca and Hartmann (Bull de la Soc Anat, 1890, No 14, quoted by Stimson), also report a similar specimen in which "the indentation lay wholly or in part along the junction of the head and shaft, above and behind the greater tuberosity, was from one to one and one-half inches long and from one-quarter to one-half an inch deep and accurately fitted the inner lip of the glenoid fossa"

Stimson, in his excellent work on "Fractures and Dislocations" (1905) says, "Fracture of the anatomical neck (with dislocation) is difficult of explanation. The probable cause, in my opinion is the wedge-like action of the inner edge of the glenoid fossa against the anatomical neck"

Salmon (Med Council, 1900, V, 134) writes as follows "Fracture of the anatomical neck of the humerus usually occurs in conjunction with dislocation. It may occur after the head of the bone has left the glenoid cavity, the sharp antero-inferior margin of the cavity acting as a wedge. The mechanical production of this fracture is illustrated by a lever of the first class, the power being represented by the weight of the arm and any force applied below the insertion of the deltoid. The fulcrum is the attachment of the deltoid, and the weight is the resistance encountered at the antero-inferior margin of the glenoid cavity"

#### ANALYSIS OF THE CAUSES OF THE INJURY, IN THE CASES HERE RECORDED, AS BEARING ON THE MECHANISM

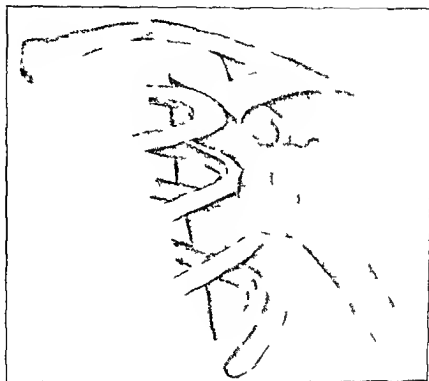
Of the 29 undoubted cases with clinical history, the cause of the injury is stated in 22. *In these 22 cases, without a single exception, the cause of the injury was a fall*

*Fall to the ground, by tripping, 6 cases* (Travers, Poirier, Poirier and Mauclore, Keen, Curtis, Buchanan)

*Fall from apoplexy, convulsions or heat strokes, 4 cases* (Houzelot, Lenoir, Curtis, McBurney).

*Fall by being struck by carriage, 1 case* (Jepson)

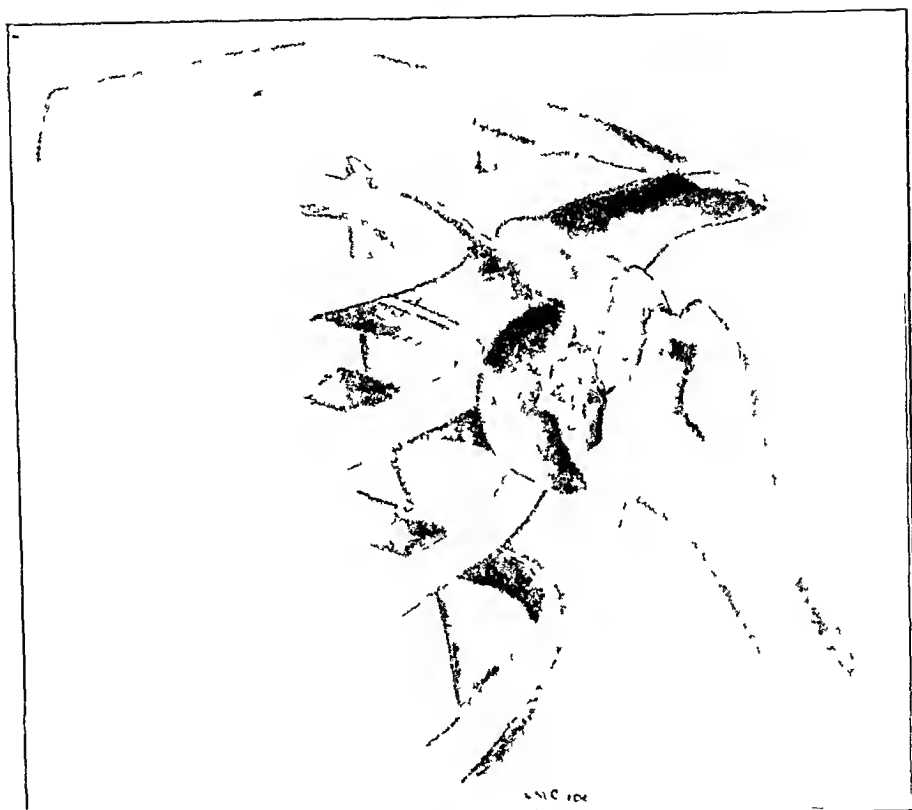
*Fall from a horse, 3 cases* (Cooper, St Thomas' Museum, Mabboux)



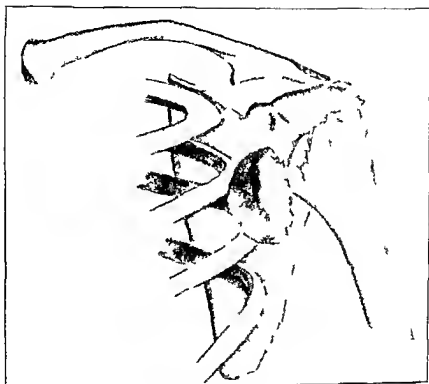
Sh pp p r t f t m l k p d t t m o t t h g l d p



FIG 5

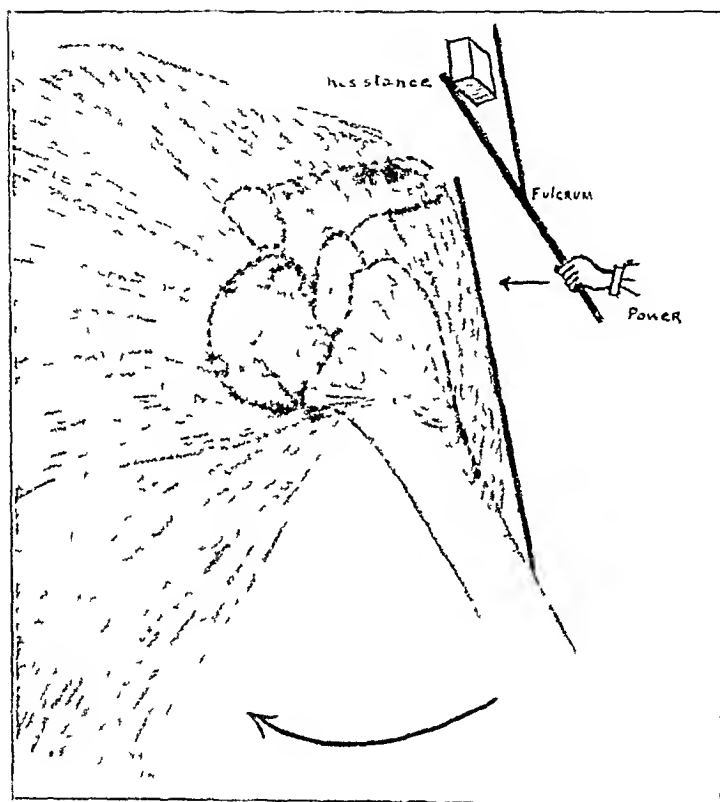


Showing head of humerus being separated by line of fracture through the anatomical neck  
by wedge like action of margin of glenoid process



H d mpt plt ffbyf ll t d Fg 4 d5

FIG 7



Muscular leverage exercised to separate shaft of humerus from fractured head

*Fall from a vehicle* 2 cases (Gerster Brigham)

*Fall down stairs* 3 cases (Key Morton Salmon)

*Fall from a height* 3 cases (Lallemand Surg Manch  
R I Croft)

#### CONCLUSIONS AS TO THE MECHANISM INVOLVED

Those specimens of dislocation of the humerus with indentations of the anatomical neck described by Eve Caird (Fig 3) and Broca and Hartmann show clearly that in certain cases after dislocation has occurred in the usual manner by hyperabduction of the limb and the head is resting under the coracoid with the upper part of the anatomical neck against the lower and anterior sharp margin of the glenoid process (Fig 4) a new application of force occurs which is transmitted through the shaft of the bone and pushes the anatomical neck with sufficient force against the glenoid edge to make the indentation

If we now suppose that this force is greater or the neck by reason of the atrophy of age is less resistant we have a partial separation of the head from the shaft by the wedge like action of the glenoid as shown in Fig 5 It is perfectly conceivable that in many cases this force should continue to act till the head is completely split from the shaft in the line of the anatomical neck (Fig 6) On the other hand it seems more probable that as the body pitches forward in falling the arm which at first is abducted and then pushed upward in the axis of the humerus should be forced against the body in adduction

The inevitable result of this adduction of the elbow would be to cause a strong leverage as shown in Fig 7 in which the long arm is the humerus from the insertion of the deltoid down to the point of application of the force the short arm is that portion of the bone from the deltoid attachment to the anatomical neck and the fulcrum is the insertion of the deltoid muscle

It is therefore probable that a fall on the outstretched arm or hand may cause (1) a dislocation that if the body pitches



and the fragments approximated satisfactorily it is probable that no surgeon would hesitate to try to restore the integrity of the joint

As an aid to the replacement of the fragment use may be made of the bodkin invented by Simon Duplay to *push* the head into place. It is described by Poirier and Maucclair (1892) as a steel rod 6 to 8 centimetres long and 3 to 4 millimetres in diameter held by a thick short handle and terminated by an abruptly conical point. Or the well known hook of McBurney (1894) may be used to *pull* the head into place.

### 3 *Excision of the dislocated head*

This seems to be the operation of choice having been performed in 14 cases with 2 results called excellent 6 good 1 moderately good and 2 deaths to its discredit.

One of these deaths (Morton's) in the first case operated on seemed to have no connection with the operation or injury. On the face of the reports as to functional results excision of the head would seem to be preferable to replacement. The number of cases however is yet too small on which to base a decided opinion.

# THE TREATMENT OF DISLOCATION OF THE SHOULDER-JOINT COMPLICATED BY FRACTURE OF THE UPPER EXTREMITY OF THE HUMERUS,

WITH AN ANALYSIS OF SIXTY-THREE CASES WITH FRACTURE AT THE NECK OF THE HUMERUS AND TWENTY-ONE CASES WITH FRACTURE OF THE GREATER TUBEROSITY REPORTED SINCE 1894 \*

BY J M MASON, M D,  
OF BIRMINGHAM, ALA

My attention has been particularly directed to the above class of injuries by a case of double dislocation of the shoulders with fracture of the surgical neck of the right humerus, which came under my care in November, 1906. The history of the case is as follows

K S, white male, aged 35, was knocked from an ice wagon by a street car and sustained injuries to both shoulders and severe contusions of the left leg. The accident happened about 9 A M Nov 11, 1906, and I saw him at St Vincent's Hospital about an hour later.

It was evident from the deformity that he had sustained dislocations of both shoulders. He was anæsthetized for further examination and for reduction of the dislocations. The left shoulder was treated first, and was easily reduced by the Kocher method. On examining the right shoulder crepitus was at once elicited, and it was found that there was a fracture very high up, as well as a dislocation. Both dislocations were of the sub-coracoid variety.

Attempts were made to reduce the dislocations but they were unsuccessful. The patient was allowed to recover from the influence of the anæsthetic, the nature of the injury was explained to him and his permission was secured to perform arthrotomy for reduction of the dislocation if we found that this should be

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\* Read at the annual meeting of the Southern Surgical and Gynecological Association, New Orleans, Dec 18, 1907

F



D loc      f h ld      pl ex d by f t f g c l k f h m      ev w k  
f p rat



FIG 2



Dislocation of both shoulders, with fracture of surgical neck of right humerus  
Thirteen months after operation



L. R. L. 1900

D l t (b tl h ld ts w hf f gual k f gh h m Tl  
m h f pe

FIG 4



Dislocation of both shoulders with fracture of surgical neck of right humerus   Thirteen months after operation



D l ca f both h id h fra t f g al k f gh h m  
 Thrt m h fl pra



necessary After consultation he was again anæsthetized six hours after the injury and further unsuccessful attempts were made to reduce These consisted principally in making gentle traction and abduction together with direct pressure on the head The joint was then exposed by the anterior incision The head was found displaced under the coracoid and a transverse fracture of the humerus was found at the surgical neck with a long splinter torn from the shaft and attached to the upper fragment The capsule was torn on its anterior aspect The upper fragment was grasped with lion jawed forceps but no change in its position could be made A periosteal elevator was then used and the head was pried into position with but little difficulty

Before effecting reduction the coracohumeral ligament had to be divided for a few centimetres

A hole was drilled through the centre of the lower fragment of the humerus near the line of fracture and a silver wire was passed through this and tied on the outer side of the bone thereby binding the splintered portion of the fracture to the shaft There was very little tendency to displacement of the fracture in an inward direction on account of the presence of a periosteal band which connected the two fragments

The divided coracohumeral ligament and the rent in the capsule were closed with catgut and a small gauze drain was carried down to the point of fracture This drain did not communicate with the joint cavity as this had been completely closed The drain was removed in a few days and the wound healed by first intention For four weeks the arm was kept on an internal angular splint with a shoulder cap

At the time of the injury the X ray machine at the hospital was not in working order so no pictures were obtained before the operation A picture taken seven weeks after operation shows a good anatomical result and the functional result is perfect There is no restriction of movement in any direction There is neither atrophy pain nor weakness in the arm The accompanying photographs taken Dec 1 1907 give an opportunity of comparing in this patient the results of arthrotomy and reduction of the fracture-dislocation on the right side with that obtained in reduction by the Kocher method of a simple uncomplicated dislocation on the left side The movements in each shoulder are as free as they were before the injury and he has been doing for

the past eight months exactly the same work in which he was engaged when he was injured,—delivering ice from a wholesale wagon, and handling 100 pound ice blocks daily

The presentation of this subject in most of our surgical text-books is not made, upon the whole, in a manner befitting its gravity and importance. There are, however, notable exceptions. Before the appearance in 1894 of McBurney's paper describing the use of his hook, very little had been accomplished in the way of successful treatment of these injuries. Too great stress was laid upon efforts to reduce by manipulation, and McBurney cites 6 cases where death resulted from the violent and persistent efforts which were resorted to in attempting to bring about reduction.

Numerous cases are recorded where fracture of the neck of the humerus has occurred in attempting reduction of difficult shoulder dislocations.

The older methods of treating fracture-dislocation of the shoulder consisted of

- 1 Reduction by manipulation. This should still be practiced with gentleness.

- 2 Securing union in the fracture and then attempting to reduce the dislocation by manipulation, using the re-united shaft of the humerus as a lever. Oger, cited by McBurney, collected all cases treated in this manner up to 1894, 10 in number, with 7 absolute failures and 3 doubtful successes<sup>59</sup>. In the series of cases herewith presented, one case was so treated, and refracture of the humerus occurred. The method has nothing to commend it, and should be mentioned only to be condemned.

- 3 The Ribérí method. This consisted in making early passive motion with the object of making a false joint at the point of fracture and leaving the dislocation untreated. This method is unworthy of consideration at the present time.

- 4 Resection. At one time this was offered as an operation of election, and is still in many cases, especially those of long standing, the best thing possible. However, as an opera-

tive procedure it should be made use of only when reposition cannot be accomplished

At the present time it is conceded that the best way in which to proceed is to first secure reduction of the dislocation and then to direct attention to treatment of the fracture

#### ARTHROTOMY

Failing in reasonable attempts to secure reduction of the dislocation by manipulation sufficient evidence is now at hand to justify us in claiming that immediate arthrotomy with reduction of the dislocation with or without the use of hooks followed by suture or reduction and immobilization of fracture is the ideal method of dealing with this class of cases

In 1839 Gross wrote I should not hesitate if a case of the kind should present itself to me to cut down upon the dislocated bone and push it back into its normal position <sup>64</sup>

Stemen in 1870 first put this plan into successful operation In one of our very latest systems of surgery however we note an anæsthetic should always be administered and every method should be tried in order to reduce the head before an operation is attempted <sup>65</sup> This to say the least certainly puts operation on the defensive

Scudder advises operation in case manipulation fails and says if operative interference has been decided upon it is best to defer operation until acute symptoms have subsided and the damaged tissues have recovered themselves <sup>61</sup> To this I do not entirely subscribe for if this teaching is followed it will eliminate immediate operation which from reported cases has given the best results He advises McBurney's operation with use of his hook

Stimson advocates gentle traction with direct pressure on the head before adopting other measures and next advises McBurney's operation <sup>6</sup> Concerning time he says I do not condemn the early operation or primary excision when indicated but I here warn against the tardy early operation cutting into swollen discolored tissues about severe injuries after the second day <sup>63</sup>



Schoch states that arthiotomy is favored by Vainossy, Nicoladoni, Keuster, Albert, Socin, Trendelenburg, Rose, Schoenborn, Nélaton, von Bergmann, and other European surgeons<sup>34</sup> A large number of the highest surgical authorities in this country also favor it

In a review of fractures and dislocations in the December (1907) *Progressive Medicine*, Bloodgood says, "when fracture is associated with dislocation of a fragment including a portion of the head, open incision should be employed if perfect reduction cannot be made" Quoting Schlange on irreducible fractures and dislocations he says, "as to dislocations there can be no question—every irreducible dislocation should be subjected to immediate open incision and reduction The time to operate is at once The changes that will take place in the joint and its surroundings by delay may be irreparable There should be no old dislocations"<sup>35</sup>

This subject should be presented to every surgeon and to every general practitioner in such a light that he may realize the value of time in the prognosis of his cases Many of these cases come first into the hands of the general practitioner, and the history of nearly all the cases classed as "old" is that they received some sort of palliative treatment, or the real nature of the injury was undiscovered until a varying time had elapsed Every practitioner should realize the gravity of any sort of fracture-dislocation or irreducible dislocation of the shoulder, for upon him rests the responsibility of placing his patient in competent surgical hands at once

While Stemen successfully performed arthiotomy with reduction of dislocation and fracture in 1870, he did not report his cases until 1893, and then they did not seem to attract much attention, so we must consider the invention and use of the McBurney hook as the real beginning of operative reductions In his collection of cases up to 1894, 117 in number, he says, "at least 6 cases of open operation can be referred to, in every one of which the head was either primarily or secondarily removed"<sup>38</sup> Stemen's cases are not included in his collection

He considered arthrotomy a grave operation which while it has resulted well in a few cases and has the endorsement of high surgical authority can possibly never give a perfect functional result <sup>s</sup>

It was claimed that the use of the hook was superior to open arthrotomy in that the hook could be used with less dissection and disturbance of the tissues and that it might in some cases be used without entering the joint at all. Recorded experiences with the hook do not seem to establish for it any superiority over open arthrotomy. The dislocated head has been reduced many more times by the use of elevators, fingers and forceps than has it been by the use of the hook and there are numerous cases of perfect results after open arthrotomy. Of the 23 cases of arthrotomy and reduction in my series secondary excision was practiced in only one instance.

So far as I have been able to find the hook has been used 12 times and has failed to reduce the dislocation in 6 instances.

The reported cases are as follows

OPERATOR	No. CASES	SUCCESSFUL	FAILURE
Bull	1		1
Brown	1		1
Curtis	1		1
Dandridge	1	1	
Morton	1	1	
Porter	2	1	1
Berger	1		1
Wythe	1		1
McBurney	3	3	
Total	12	6	6

These cases with the exception of McBurney's first case are recorded in my tables. Dandridge's case had recurred at the end of a month and he says of it "either the dislocation had recurred or it had not been reduced." <sup>t</sup>

Upon this showing I do not believe the use of the hook is entitled to the prominence that is given it in the text books.

McBurney collected from the literature up to 1894 117 cases of dislocation of the shoulder with fracture at the neck of the humerus. To bring the statistics up to the present time